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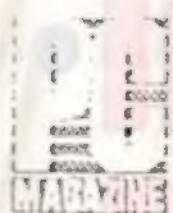
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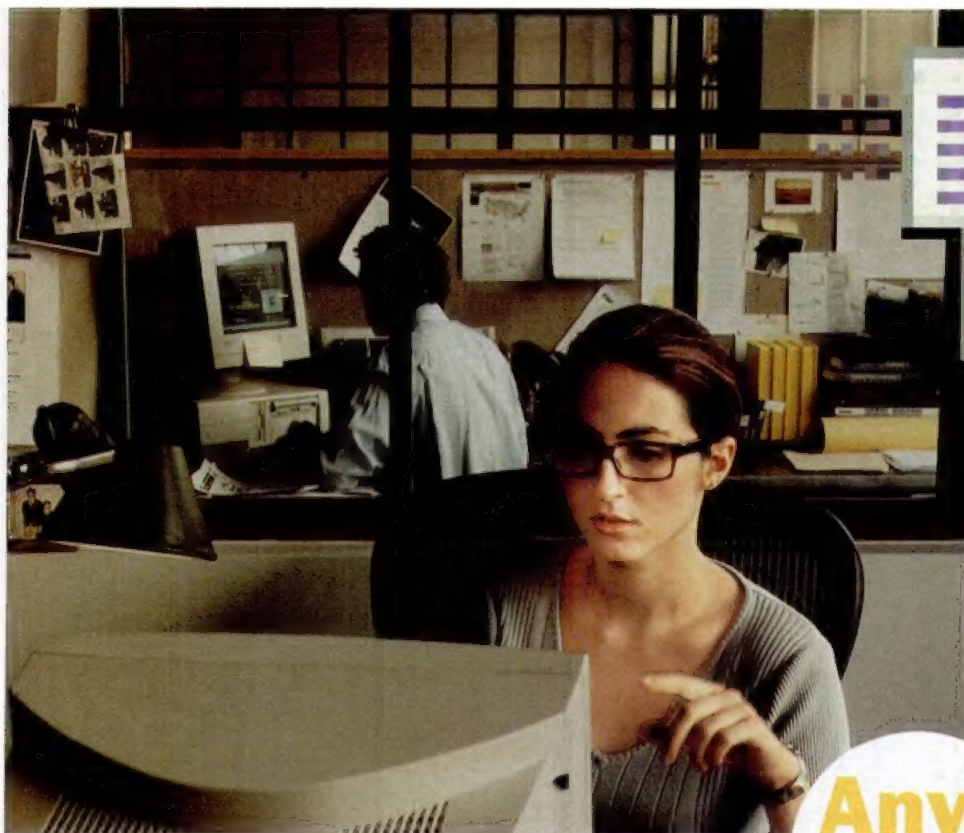






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# Java, No Pun Intended



It's a programming language. It's an operating environment. It's a caffeine-laced beverage. And, according to its proponents, it's the future of computing. It, of course, is Java, which is well on its way to becoming the most overhyped trend in software since Windows 95. But rather than praising Java or burying it,

it seems much more compatible, although performance on older systems still isn't great. Would we like these systems to be faster? Sure. But the biggest problem for most folks is simply downloading the application through the Internet, and that isn't Java's fault. No alternative is any better. Dynamic HTML doesn't do as much, and Microsoft's Active-X doesn't support nearly as

let's take a closer look at what Java really is and is not.

Java is...a next-generation programming language. Moving a step up from C++, the team at Sun that created Java had the chance to start anew. Java doesn't carry all the baggage of earlier languages, and many programmers find it easier and more modern. The tools for creating Java programs have gotten better, coming from vendors like Borland, Microsoft, and Symantec. Java certainly won't be the only programming language, but it will clearly be a force for some time to come.

Java is...a cross-platform operating environment for mission-critical applications. This may be the most controversial claim, and the one we can least well answer. Although the tools for creating this kind of application are improving (and we'll cover a few in our next issue), they still aren't quite up to their Windows counterparts. Sun proposes its JavaBeans as a way to tie components together, and that idea seems to be gaining converts as well. One thing we know is that Java won't be as fast as a native application. Still, it is designed to be cross-platform, a big advantage for mixed environments or in situations where you don't know what software the clients will have.

Java is...a cross-platform method for adding small programs to Internet and intranet sites. As such, Java is a *virtual machine* (VM) that runs on top of existing operating systems, either directly or as a component of a browser, most likely Microsoft Internet Explorer or Netscape Navigator. Lots of Web sites have deployed small Java applets with reasonable success.

So far, Java's cross-platform abilities haven't quite lived up to its claims; implementations of Java on such platforms as Windows 3.x or Macintosh have been inconsistent or slow. But Java 1.1 is now rolling out, and

many clients. So while Java isn't perfect, it may well be the best solution.

Java is...an operating system. Well, there is something called the Java OS, theoretically a low-functionality OS that runs with a Java VM. Hypothetically, it could run on a Network Computer or other appliance and offer mostly server-based Java apps. Many organizations are looking for a way to manage their applications better, and Java, whether on top of its own OS or another, does offer a solution. If nothing else, Java seems to be prodding Microsoft to make Windows software more manageable at last. Do you want to start with a legacy base of software and add manageability (as in Windows) or start with a manageable concept but little existing software (as in Java)? There's no doubt we are in the early stages of a potentially huge OS battle.

Java is...a standard for the future of computing. In other words, Java is...a religion. As for me, I don't buy into software platforms as religion. I believe there will always be multiple languages and multiple platforms, each best suited for particular cases. And I believe that competition is good. Thus far, it looks as if Sun has established Java as a competitive language and is beginning to establish Java as a platform, at least on Internet sites. If nothing else, Java has made Microsoft sit up and take notice of serious Windows issues, such as problems with managing and updating applications. Even if Java never becomes more than it already is, the language may qualify as a success on that alone.

A stylized, handwritten signature of Michael J. Miller in black ink.

MICHAEL J. MILLER



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COVER STORY



# Personal Printers

BY BRUCE BROWN, ALFRED POOR, AND WINN L. ROSCH

If you're in the market for a new printer, you're in luck. Right now, you have some great choices: Some color ink jets go for \$150, monochrome laser printers run \$300 to \$400, and multi-function printers do plenty for their higher price tags.....104



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### Choose the Right Printer

Trying to find the right printer among the dozens we tested for our cover story? Turn to our exclusive interactive summaries of features to home in on the model that has what you need. Plus: Want to get graphics onto your Web site? Chances are you'll need a good scanner. Check our performance test results to find the best models.

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## DOCUMENT IMAGING

# Taming the Paper Tiger

BY BEN Z. GOTTESMAN

If the paper situation in your office is as bad as we think it is, you should consider one of these personal document-imaging packages. You just feed the paper documents into your PC via a flatbed or sheet-fed scanner, then these packages help you manage the electronic images. Some even do OCR (optical character recognition) .....197

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# SOHO Scanners

BY DAVID A. HARVEY

One of these sheet-fed scanners would be a good companion to one of the document-imaging packages we review starting on page 197. These 11 sheet-fed units all support color scanning; in addition, they're all Twain-compliant, and each carries a street price of under \$300. In fact, most come with bundled document-imaging software, but you'll want to check out our Editors' Choice recommendation on the best combination of hardware and software. Not sure whether you need a sheet-fed or a flatbed scanner? We'll help you with that question, too .....229



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# Pipeline



## Hail to AOL

In a complex deal resembling a game of hot potato, WorldCom is acquiring CompuServe and handing over CompuServe's content and subscriber base to America Online, along with \$175 million in cash. In return, America Online is giving WorldCom its Advanced Networks and Services division, which provides network services and Internet access. America Online will market CompuServe under the CompuServe name, as an extension for AOL users.

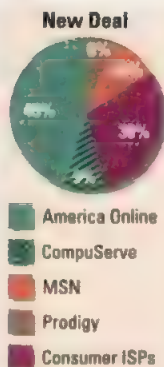
For America Online, gaining CompuServe's 2.6 million subscribers—many of whom are business users—represents the brass ring in the deal. America Online already has 9 million subscribers. CEO Steve Case emphasizes that gaining CompuServe's subscribers will provide

more of a foothold among business and European users and a big boost in AOL's subscriber base.

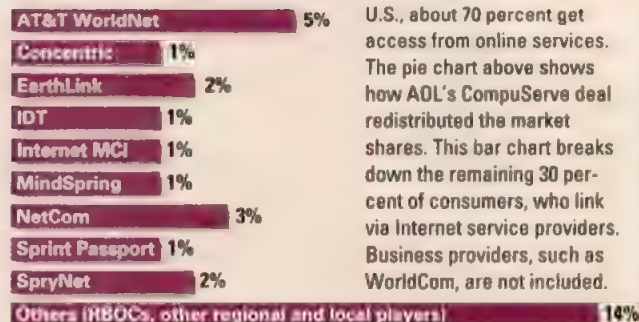
Another bonus for America Online is that WorldCom will provide the network-services infrastructure for AOL users under the terms of a five-year agreement. This will at least partially relieve America Online from dealing with headaches such as the past year's access problems.

AOL's increase in subscribers has fueled the company's growth. And with nearly 12 million members after the deal, America Online will have nearly six times as many subscribers as The Microsoft Network.

Analysts and customers have raised concerns about the quality of AOL's service and prices following the deal. Negative comments flooded Web-based discussion groups after the announcement. One CompuServe user said that "the deal will mean poorer-quality service for CompuServe members, and higher prices for everyone." Another user said that "this deal may give AOL a monopoly-type power."



## What's My Link?



Source: IDC/Link. Date as of June 30, 1997



"The Internet took 5 years to reach 50 million users. Cable TV took 10 years, radio took 38 years, and the telephone took 40 years."

—Netscape CEO Jim Barksdale, speaking at the Java Internet Business Expo.

## ISP Takes Flight

Your next Internet service provider has a plane to catch. Angel Technologies, based in St. Louis, Missouri, is designing a wireless communications network that will provide wireless Internet access via souped-up airplanes. Each High Altitude Long Operation (HALO) airplane will carry an antenna and communications equipment on a pod that's attached to its belly.

The planes will beam broadband services such as Internet access, video on demand, and two-way conferencing at 1 to 5 megabits per second, as they fly in a circular pattern 50 to 75 miles in diameter over major metropolitan areas. To receive signals, homes and offices will need special roof-mounted satellite dishes.

Angel Technologies contends that a satellite requires substan-

tially more time and money to build and upgrade than a HALO airplane. Motorola's Iridium project, for instance—a \$4 billion system of 66 low earth-orbit satellites for provid-



ing wireless fax, paging, data, and voice transmissions from anywhere on earth—has been in the works for nearly a decade.

But the HALO Network is designed to complement satellites rather than replace them. In fact, negotiations are underway to form partnerships with satellite companies that may want additional broadcast capabilities. The first flight is scheduled for the first quarter of next year.

[www.pcmag.com](http://www.pcmag.com)

### How to Choose the Right Printer

Trying to find the right printer from among the dozens we've tested for this issue? Turn to our interactive summaries of features.

### The Browsers Of 1998

We're keeping an eye on the latest browser developments. Check in today to get the news.

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# Pipeline

## Air Web

No one's waiting around for the computer and broadcast industries to agree on a way to deliver high-definition television (HDTV) signals to PCs. The prospects are looking pretty dismal. In the meantime, entrepreneurs are coming up with ways to broadcast Web content over the airwaves to PCs.



Reston, Virginia-based Datacast, along with TV station affiliates, is running trials of its *multimedia broadcasting* system. This service delivers a slew of content—Web sites, games, applications, software updates, news, sports, weather, traffic, financial data, and commercials—via satellite to PCs equipped with \$100 Datacast receivers. The technology transmits digital information in the *vestigial sideband* of NTSC television signals, at a throughput reaching 560 Kbps.

CEO John Abel, who positions the service as “not the Web and not TV, but in the middle,” says that the business model is the same as that of local TV stations, one that enables both local and national advertisers to reach a wide audience. You’ll be able, say, to view simultaneously a movie trailer and local listings of theaters.

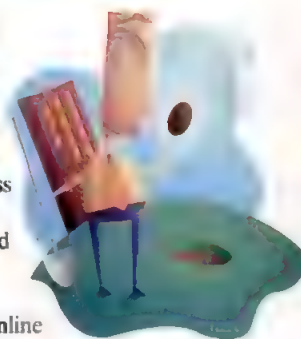
The system doesn’t broadcast data in real time. Rather, content, along with a continuously updated guide, is available 24 hours a day.

First to get the service will be Buffalo, Dallas, Los Angeles, New York, and Phoenix, starting in the first quarter of 1998.

## Everything's a Bean

At Netscape's recent Strategy Day, executive vice president Marc Andreessen said Netscape is staking much of its future on Java. “We want people to run Netscape on any device that comes out that can access the Internet,” he said. The upcoming Java version of Netscape Navigator, code-named Gemini, will have an HTML-rendering engine that's a JavaBean.

Andreessen promoted Netscape's new online service Netcenter as a repository for all the JavaBeans you might need. For instance, if you're using Gemini and you encounter a file format it can't recognize, the JavaBean can download what's necessary to render the image or file. “We see Netcenter as the place where all those files would be stored for you,” Andreessen said, referring to his idea that all Web software could be componentized as JavaBeans. Even Navigator may exist as many server-based components you could download.



## Extreme Chips

A private industry group led by Intel, Advanced Micro Devices, and Motorola has joined forces with the E. O. Lawrence Berkeley National Laboratory, the Lawrence Livermore National Laboratory, and the Sandia National Laboratories (collectively the Department of Energy's Virtual National Laboratory) to create powerful new chips. The advanced lithography research aims to make chips with 100 times as much computing power and 1,000 times as much storage capacity as is possible today.

Called Extreme Ultra Violet (EUV), the technique will let manufacturers etch circuit lines smaller than 0.1 micron wide. The industry has just begun producing microprocessors using 0.25-micron technology.



(One micron is 1/100th the thickness of a human hair.)

The group, called EUV LLC, plans to invest \$250 million in private funding over the next three years to develop the technique for commercial chip manufacturing. It hopes to move today's developing EUV technology into factories early in the next decade. Intel projects that the microprocessor of the year 2011 will contain 1 billion transistors, operate at over 10 gigahertz, and deliver 100,000 MIPS (million instructions per second).

## Good News for Couch Potatoes

For the holiday season, it looks as if WebTV Plus will be the only TV/Internet product on store shelves. WebTV Networks' dramatically upgraded \$299 version of WebTV will let you watch TV and surf the Web simultaneously. It will also allow the creation of special Web pages to go with TV shows or commercials.

As you watch TV, you'll get an alert that such a page is avail-

able, and you'll be able to bring it up while the show or commercial runs in a window. You'll be able to visit the Internet Movie Database to learn more about a film or obtain up-to-the-minute stats during sports events.

Along with the Rockwell K56flex modem, the new box will have a 1-gigabyte hard disk that the service will fill with video clips and graphics overnight. Connections will cost \$19.95 per month.

THIS ISSUE'S CONTRIBUTORS: Angela Hickman, Carol Levin, Sebastian Rupley, and Don Willmott.

## Top-Selling Desktop PCs

- 1 Hewlett-Packard Pavilion 7420 166 (\$1,490)
- 2 Hewlett-Packard Pavilion 7410P 200 (\$1,464)
- 3 Acer America Aspire 2753 200 (\$2,204)
- 4 Toshiba Infinia 7201 200 (\$1,390)
- 5 Compaq Presario 4808 200 (\$1,963)
- 6 Compaq Presario 4504 200 (\$991)
- 7 Hewlett-Packard Pavilion 8140 200 (\$1,850)
- 8 Compaq Presario 2120 150 (\$889)
- 9 IBM Aptiva S3C T5 233 (\$2,120)
- 10 Compaq Presario 4814 233 (\$2,448)

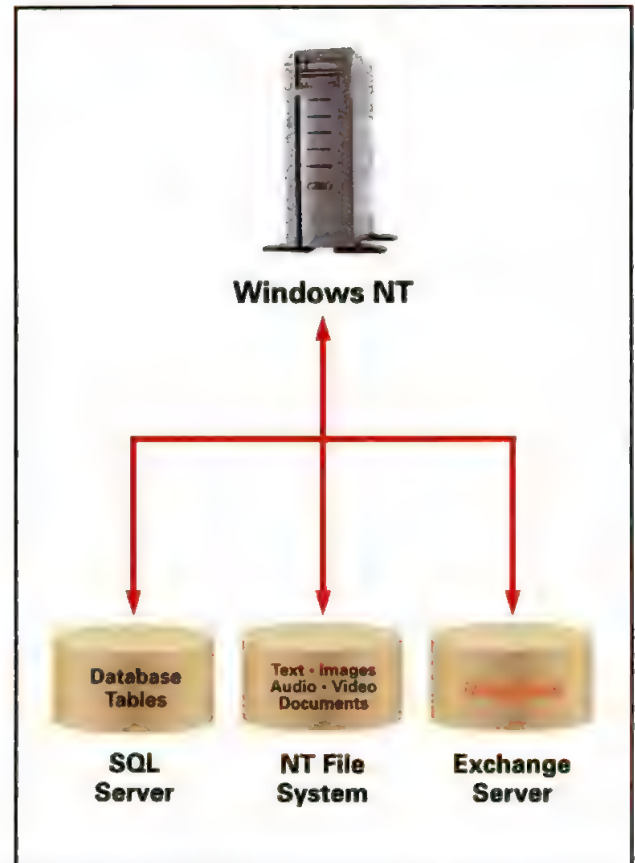
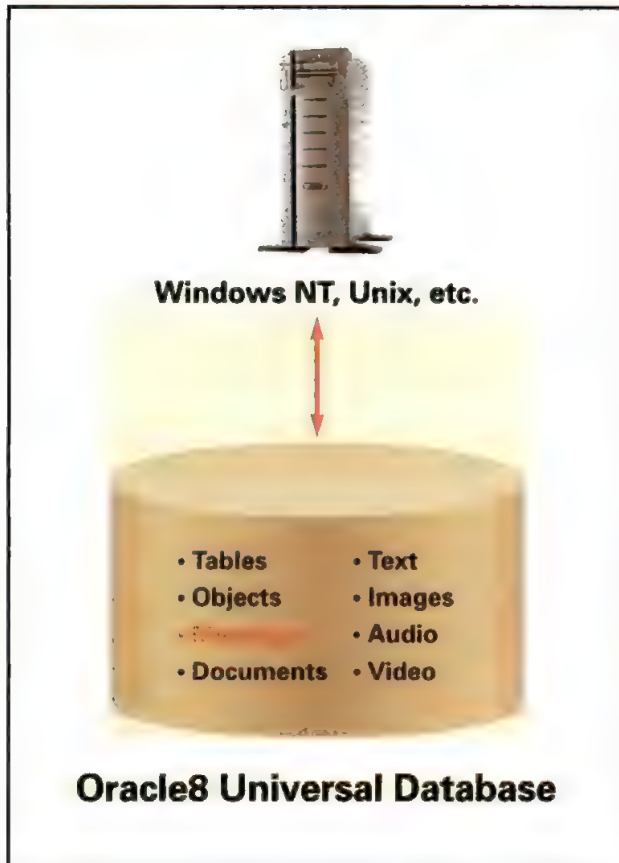
Source: PC Data. Data for July; based on retail sales.



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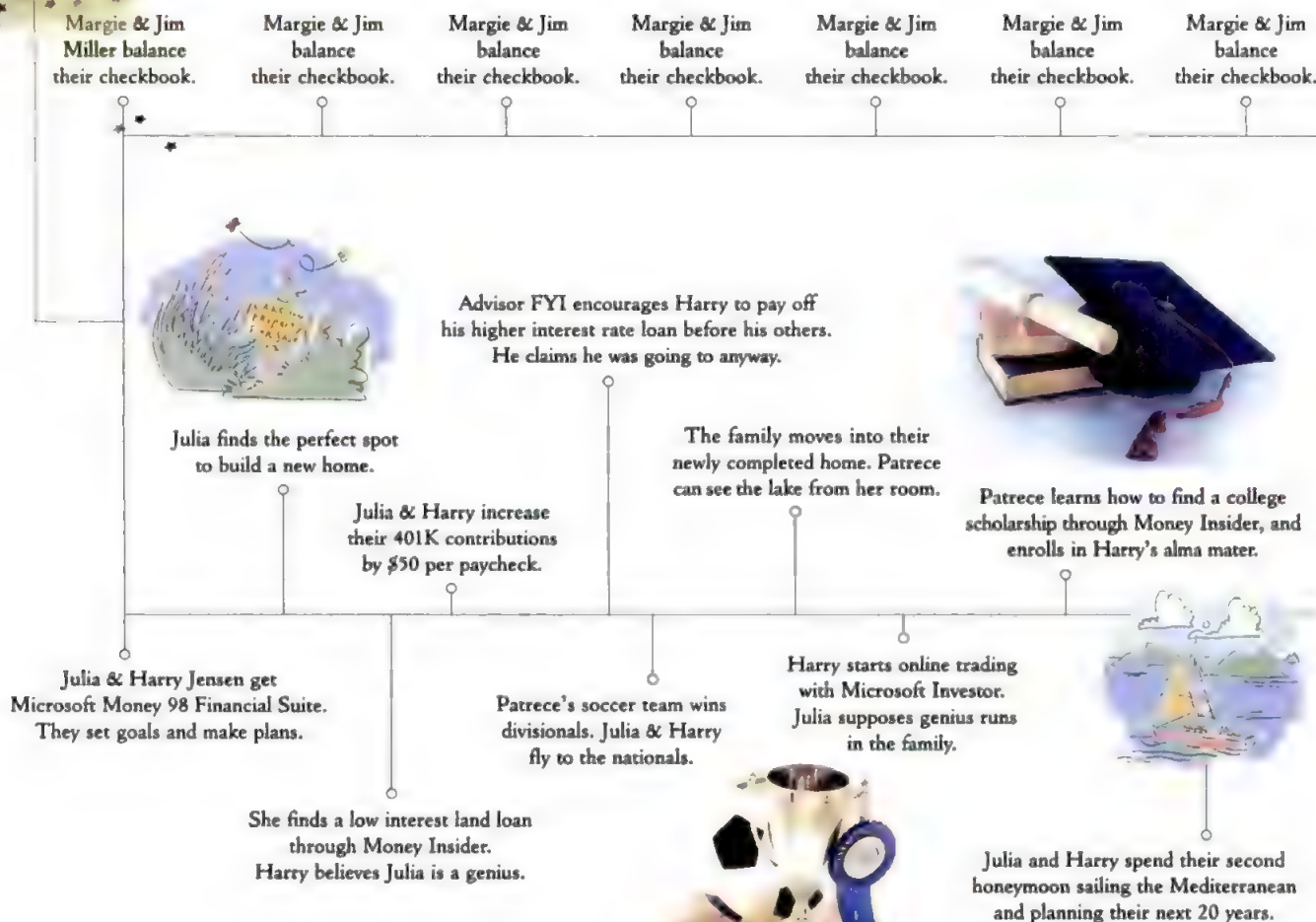
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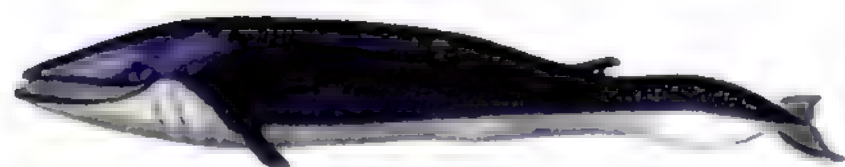
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# Letters

## INSIDE "INSIDE TRACK"

I am amazed that John C. Dvorak cannot see a viable method of introducing a Web site-rating system (Inside Track, September 9, 1997). Instead, he suggests that pornographers who routinely clutter up newsgroups should voluntarily adopt a new addressing scheme to hide themselves on the Web. Is he joking? Why not introduce an extension to HTML to provide for a rating tag (like `<RATING="G">`) in the head section? Web developers could rate their own sites according to published standards, and options could easily be added to browsers so that access would be denied to sites with too strong a rating or ones that do not have the `<RATING>` tag. Pornographers cheating on the rating system could be reported to a government watchdog agency and fined accordingly. Unless something is done, my children will not be surfing.

JOHN CLIMENHAGA  
*via the Internet*

Dvorak raises some interesting points regarding a possible Web site-rating system ostensibly suggested by Al Gore. He goes on to suggest an alternative plan to develop an entirely new Internet "system, or subsystem, or simply a different addressing scheme." Under this new system, "pornographers would voluntarily put themselves on the alternative system or face fines." As a former executive director of the Parents' Music Resource Center (PMRC), the organization that negotiated the current labeling system with the Recording Industry Association of America and that Tipper Gore helped found, I am aghast. First, any system that sets fines for noncomplying organizations is not a voluntary system. Also, the presence of fines suggests a government agency overseeing the system. By contrast, not only are the record-labeling system and the movie-rating system voluntary but the concerned industries are the ones doing the rating.

TOM DAVIS  
Washington, D.C.

Dvorak can rest assured that Microsoft won't be selling fly-by-wire software to Boeing and Airbus Industries, as he mentions in his September 9, 1997, Inside Track. Boeing has only one fly-by-wire jetliner, the 777, but all Airbus jetliners are fly-by-wire. As someone training to be an airline pilot, I seriously doubt that any aircraft manufacturer would use a Microsoft OS to translate control inputs to control-surface variations. Even if Windows NT could by some far chance manage such a task, triple-redundant systems, which are commonplace on modern jetliners, would not be reliable enough for manufacturers. Current on-board computers almost never fail. I have



## Dvorak raises some interesting points about a possible Web site-rating system.

yet to see any piece of Microsoft software that can make the same claim.

CHAD KINTZ  
*via the Internet*

## THUMBS UP FOR THUMBSPLUS

Dvorak (Inside Track, September 23, 1997) had good things to say about ThumbsPlus—a remarkable program—but more needs to be said. I work with the major photo-editing and publishing programs and find ThumbsPlus to be a powerful complement to the best of them. It is a big, complex program that manages your images and fonts wherever they are, including removable media. The more you use this program, the more you respect its capabilities and user-friendliness. Yes, it is big and complex, but guess what? It comes to you on two floppy disks—some accomplishment in this age of program bloat.

ED PEARSON  
Bismarck, Arkansas

## STICKY FINGERS

Jim Seymour's column in the September 9, 1997, issue ("Power Notebooks Again Ascendant") was most informative. I have no doubt it is technologically correct, but economically, I wonder. A recent survey of airlines shows that laptops are the prime target of thieves, and the more expensive they are, the better the prize. Consequently, knowing that the possibility of theft is great, many companies buy the barest minimum number of notebooks in order to minimize possible losses. I would like to take my laptop with me to Europe but have been advised to leave it home, not just because of theft on planes. As one travel agent told me:

"If you insist on taking it, carry it everywhere. To dinner, to the opera...everywhere."

WARD BOTSFORD  
*via the Internet*

I agree wholeheartedly with Seymour's column on power notebooks. I have a Gateway 9100, an outstanding performer. The display is great, and the machine rips through compiles. I'm a software developer, so there are never enough pixels on the screen when I'm using something like Visual C++. Many of the extras, such as a game port, an infrared port, and a video in/out port, don't get used, but they come in a high-end notebook, and that's fine. The unit cost me \$8,000 (Canadian), and even though the money comes out of my own pocket, the power notebook is worth every penny.

STEPHEN CRAMP  
*via the Internet*

## PUSH AT SEA

I agree with Seymour that push technology can be more of a nuisance than a help ("Push Back!" August 1997). However, I am in the Navy, and at sea, news is hard to come by. The Navy is just getting Web access at sea, and it is not yet reliable. E-mail at sea is in better shape and fairly reliable. Many sailors subscribe to Infobeat: It lets you select news topics you are interested in, and it arrives via e-mail. Hot links are available in case you desire more details. These links are where the ads are, so if all you do is read the news—which is what I do—you never see the ads.

RANDY EVERETTE  
*via the Internet*

## HONESTY IS THE BEST POLICY

I disagree with Bill Howard in his column "In the Interest of Everyone" (September 9, 1997). There may be some larceny in all of us, but the quality that makes the difference between staying on the street and being in jail is called self-control. I am an honest employee who wouldn't take home a paper towel. I enjoy being honest, even if my employer doesn't appreciate it. I wouldn't appreciate an employer withholding a raise from me because he or she is too lazy to put a stop to pilferage at the workplace. Dismissal stops pilferage. Not only does it stop the thief; it also sends a very clear message to the rest of the employees. For employees who take their work home, the company can give them an expense account and make them accountable. How many employers request their employees to be bonded and yet fail to check them out? This issue of ethics is not gray, and neither is the law. Stealing is a crime.

BOB MANDRYK  
*via the Internet*





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# Letters

Howard's opinion regarding the inevitability of employee theft is preposterous. He apparently thinks that normal people cannot distinguish between work that they do for their employers and work that they do for themselves. I find his cynical acceptance of unethical behavior in the workplace to be the very definition of *insulting*.

GEORGE COPELAND  
via the Internet

Yes, we know that dishonesty and theft occur, but no member of our society should condone them. What would children and teenagers think if they read this column by an adult in a respected publication? Publishing an article making light of theft is irresponsible.

HUGH N. HAZENFIELD  
Wahiawa, Hawaii

## OVER THE LINE

I'm appalled at your comment, "Dungeon Keeper is one of the best games we've played all year" (After Hours, September 23, 1997). Did you read the back of the box? The ESRB (Entertainment Software Ratings Board) rating is Mature 17+, and the game has animated blood, gore, and violence. Tell me that this is all tongue-in-cheek, high-camp fantasy. Tell me it's just a game. Show me a hint of that somewhere on the package or somewhere in your review. Would you want to live next door to a guy who stays up all night playing this one?

Your review isolates content from context. It implies that degrading violence is acceptable as entertainment as long as you have the hardware to display it. How outrageous must a program be before we get a reaction from

## HOW TO CONTACT US

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We regret that we cannot answer letters individually. To send submissions for PC Solutions, please see the sidebar "How to Contact Us" on the last page of that column.



## CORRECTIONS AND AMPLIFICATIONS

In our October 7, 1997, First Looks article "Mobile Powerhouses," the correct name of the Quantex notebook is actually the Quantex H-Series 1330.

In our September 9, 1997, article "Choosing Your ISP," we incorrectly said that EarthLink, an Editors' Choice, charged an extra \$4.95 per hour for 56K access. At the time, members could get 56K access only by dialing in using the toll-free service, which cost \$24.95 per month for 5 hours, with each additional hour costing \$4.95. Some users can now get 56K access under EarthLink's \$19.95 unlimited-access plan, at no extra charge.

In our September 9, 1997, story "The Top 100 CD-ROMs" (After Hours), on page 384, the street price of the CD-ROM title MasterClips 150,000 Premium Image Collection should be \$70, not \$40.

you stronger than "the graphics, sound, music, and game play are all excellent"?

RICHARD E. SCHMIDLE  
via the Internet

We felt that the game's intended age range (17 and up) was implied by the content and—as you point out—the ESRB rating on the packaging. Still, we should have defined the game's target audience more clearly in our review. Our opinion of the game, however, remains the same, and we remain impressed by the title's excellent graphics, sound, and game play.—Ed.

## PROCESSING THE PERFORMANCE

Your coverage of the top 12 processors ("The Best CPU for Your Next PC," September 23, 1997) was very informative, especially about the performance aspects. I was pleased to see that my purchase of a 233-MHz K6 processor was justified by a great price/performance ratio. However, this article leaves one question in the minds of many who, like me, try to get the most out of their hardware. I have 64MB of EDO RAM—a necessity for Windows NT, but I'm using Windows 95. I noticed that most CPUs gave ZD Business Winstone 97 20 to 25 percent better scores when run on Windows NT versus Windows 95. Yet I have heard many say that Windows NT is slower than Windows 95 on equal hardware. Why does Windows NT seem to be better for 32-bit business applications? If I used Windows NT, would I be able to see a difference in speed with 32-bit applications?

RYAN M. RODGERS  
via the Internet

Winstone 97 is a measure of apparent performance. What you see is how the system performed in running those profiled applications irrespective of the operating system. If a system scored 5 percent better under Windows NT than Windows 95, then the system is that much faster under Windows NT. The general perception that Windows NT runs slower than Windows 95 on a given system probably arose when the prevalent system configurations were not powerful enough to support the resource-hungry Windows NT. It was inevitable that Windows NT, a true 32-bit operating system, would outshine Windows 95. The CPUs described in that

article are optimized to run 32-bit codes, and we packed the test systems with 32MB and 64MB of RAM to reflect today's mainstream configurations. Also, in going from 32MB to 64MB, there is a much larger performance gain under Windows NT 4.0 than under Windows 95. This leads us to believe that Windows NT takes better advantage of any added memory.—Ed.

## GLAD TO PUT UP WITH SHUTUP

For a long time now, I've been frustrated with not knowing how to have Windows 95 run a batch file when it closes. I'm not much of a programmer, nor do I have time to be. When reading the September 9, 1997, issue (PC Tech/Utilities, "Automate Tasks at Shutdown"), I came across your review of the utility ShutUp, which satisfies my need. Once again, one idea alone is worth the price of this year's subscription.

RON ROBERTS  
via the Internet

## HP CARS FOR REAL

The Hewlett-Packard cars for sale in *The San Francisco Examiner* ad (Abort, Retry, Fail?, September 23, 1997) are, in fact, Hewlett-Packard cars. Every year, HP turns over its fleet of company cars, and to my knowledge, the old ones are recognized as excellent buys. My wife has one. The ad communicates exactly what it intends.

ED BRINK  
via the Internet

## URL CONFUSION

Please consider adding a table to each issue of the magazine listing the URLs mentioned in each article, as well as a brief word about what they are for, and maybe the page number of the article each URL was cited in. You toss URLs around with such abandon that it is hard to remember which ones I want to check out. It is not convenient to write a URL down every time I see one, nor can you expect me to run over to the computer and log on each time I see a URL worth investigating. It would be nice to be able to flip to the back and check off the ones that look interesting, and even better to be able to tear out the list and file it by the computer.

DENNIS BLACKWELDER  
Champaign, Illinois



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# Trends



## Let Consumers Govern the Net

Fresh approaches to minimizing junk e-mail and protecting privacy.

**H**ow do you govern the Internet without yielding to the heavy hand of traditional government? Industry pundit Esther Dyson proposes a novel system of self-regulation to minimize junk e-mail, control offensive content, and ensure privacy. Her answer is not to overthrow government on the Internet but to rethink the traditional concept of government.

Dyson, editor of industry newsletter *Release 1.0* and chair of the Electronic Frontier Foundation, suggests that making the Internet a place where people will want to do business and let their children roam is a real challenge. Such a change will come about "not through government regulation but through rules," she contends. In the U.S. model, the people own the government but it has a single set of rules. According to Dyson, "The promise of the Internet is that you don't need one government. People can have many governments."

Take junk e-mail, for instance. Spamming is a big business, because sending e-mail is so cheap. But what if it weren't so cheap? Dyson's proposal, just one of many possible approaches, would make spamming unprofitable. Her solution is pretty simple: Give consumers control over what e-mail they receive.

Here's how such a system would work. Eventually, an e-mail package will connect with a payment mechanism located, perhaps, at an online service. You'll be able to charge a fee (\$1,

\$3, or whatever) to anyone not in your address book who sends you e-mail. You pocket the fee if the sender follows through with delivery. If the e-mail is useful, you can cancel the charge.

Internet service providers will probably get involved in running the payment scheme. "It's going to be a very decentralized marketplace," Dyson says.

### TRUST ON THE INTERNET

Privacy is another area where self-regulation may have a fighting chance. "Privacy is going to be a problem in the consumer marketplace," Dyson says. Before the end of the year, she predicts, we'll see a "60 Minutes" story about someone whose privacy has been breached on the Internet. "People get to choose their toothpaste and their breakfast cereal. Why can't they choose what happens to their data?" she asks.

How can consumers control their own data? One approach is Netscape's Open Profiling Standard (OPS), whereby you decide

how much information to disclose to each Web site. You know exactly what information you're handing over, since you fill in your profile with information such as name, address, e-mail address, age, marital status, and hobbies.

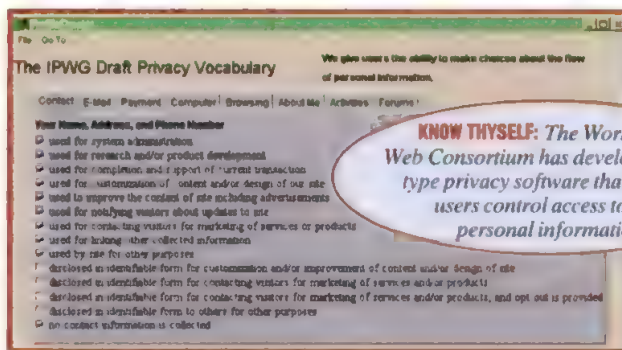
OPS promises to inform you of what data your browser provides to Web sites, and it lets you tag each piece of data and indicate to whom you want information revealed. You could specify, for instance, that a site not make personal information available for promotional mailings. Netscape has submitted the proposal to the World Wide Web Consortium's Platform for Privacy Preference Project.

But who makes sure your choices are carried out? Enter TRUSTe, an auditing and labeling mechanism that the Electronic Frontier Foundation and CommerceNet founded as a jurisdiction outside national boundaries. "Fundamentally, the concept doesn't depend on national laws," Dyson explains. TRUSTe has developed symbols, or "trustmarks," to tell site

visitors what personal information a site is collecting, the purpose for which it will be used, and with whom the site is sharing it. The approach, which depends on

a contract between a Web site and TRUSTe, is designed to provide a trusted brand for privacy.

"The challenge," says Dyson, "is not to make this a one-size-fits-all world but to keep it open, pluralistic, and decentralized."—Carol Levin





# DVD Surprise

Intel's compatibility testing uncovers problems with DVD titles.

**A**fter a long incubation, super-high-capacity DVD drives are here, but can you run software on them successfully? Intel tested 40 titles on 25 DVD-ROM-equipped systems, and it came up with disappointing results.

Two-thirds of the titles used MPEG-2 video compression; of those, 66 percent were

incompatible with some decoders. Of the one-third of all software titles that didn't use MPEG-2 video compression, 95 percent were compatible across drives from different manufacturers. Among the myriad problems that the testing uncovered, some titles

coughed up multimedia system errors, refused to play audio, or dropped video frames.

Developers are working day and night to solve the compatibility issues, says Intel DVD evangelist Greg Berkin. "We fully expect that 100 percent compatibility can be achieved with exhaustive testing," he says. Over 80 DVD-ROM software titles—from games to phone directories—are under development.

Although a standard exists for playing movies on DVD, developers have not agreed on a standard command set for running software on DVD. And without one, there's no guarantee that software will work consistently across the dozen or so MPEG-2 decoders.

Problems arise not with the 20 basic commands of a spec known as Media Control Interface (which control tasks such as opening and playing files) but with the extensions to MCI (which tap DVD's advanced features, such as overlays for subtitles). To ensure interoperability of the titles available for the holidays, Intel is discouraging developers from using advanced DVD features. This will also smooth the transition to Microsoft's DirectShow, which will replace MCI and directly support DVD. Some game developers are working with the pre-release version of DirectShow. Microsoft plans to ship the final version by the end of the year.

To complicate matters, titles written with MCI may need upgrading for Windows 98. Microsoft is encouraging developers to switch immediately to DirectShow. "MCI for DVD is in its last gasp," says Peter Biddle, Microsoft's DVD hardware evangelist. —Carol Levin



## Beware of Software Hoaxes

BY NOW, MOST OF OUR READERS ARE aware of the myriad virus hoaxes that are circulating around the Internet. Probably at least once a month you receive an e-mail warning about death and destruction at the hands of a wayward .EXE—which, as it turns out, doesn't even exist. This column is about another type of hoax of which you should be aware: a program distributed via the Internet that promises miracles but delivers little more than fairy dust.

A reader recently brought such a doozy to PC Labs' attention. A file called `Mmx_upg` would supposedly upgrade a standard Pentium chip to support MMX, a series of multimedia instructions that allow parallel operations on up to eight data items. Hardware support is central to MMX, because the operations occur in the processor storage areas called physical registers.

Although we were skeptical about this file, we could conceive of a software program that would provide a processor with MMX capabilities. A non-MMX processor, upon issuing an MMX instruction, would raise an "invalid opcode exception"—in other words, an error condition indicating an unrecognized instruction to the processor—and theoretically a program could intercept this condition. If the instruction were an MMX instruction, a program could conceivably attempt to handle it by employing conventional Pentium code.

Using this software-based method, however, would take an appallingly long time. First, the exception handling itself would consume a fair amount of time. In addition, the non-MMX processor would have to operate on data contained in memory, instead of employing physical

processor registers as an MMX chip does, and that would slow down the process considerably. This would seem to be rather pointless, since the objective of upgrading with MMX is gaining better performance.

In order to test `Mmx_upg`, we first ran the file and then analyzed it with Sourcer, a development tool from V Communications that reverse-engineers .EXE files into assembly language. `Mmx_upg` contains two files, `Mmx_upg.exe` and `Mmx_inst.ins`, the latter of which claims that it includes an "instruction set" for MMX. In fact, we found that `Mmx_upg.exe` never reads `Mmx_inst.ins`. After we deleted `Mmx_inst.ins`, the program ran without a single hitch and displayed a message indicating that it was able to read the instructions from the file. At the end

of the "installation," a message appeared claiming that the Pentium processor had upgraded with MMX instructions. By the way, this program works just as well on a 486!

And here's the best part: `Mmx_inst.ins` is actually a RealAudio 4.0 file. By renaming the file `Mmx_inst.ra`, we were able to play the late grunge band Nirvana's

song "Come as You Are (Live from Australia)."

The lesson to learn here is that you need to be especially skeptical of a product that makes extravagant claims, especially if it doesn't come from a manufacturer that you know and trust. You should demand to see evidence of the product's performance. `Mmx_upg` turned out to be simply a harmless ruse, but the file might have been a virus, a dangerous Trojan horse, or an expensive practical joke. You can't ever be too careful.

—Larry Seltzer





## The Purrfect Artificial Brain

Researchers plan to harness a neural network to power a robotic kitten.

**W**ould your cat scratch you if you pulled its tail? Probably, and so would the life-size robotic kitty that Japan's Advanced Telecommunications Research (ATR) Institute is creating. The kitten will have the world's first artificial brain, which will enable it to respond to stimuli with feline behaviors such as scratching, tail wagging, and purring.

The quadruped's "brain," dubbed the CAM-Brain Machine, is currently a desktop computer running a series of mathematical processes, called genetic algorithms. Researchers will use them to build an artificial neural structure—a network that can "rewire" itself over time by choosing the most optimal of the possible algorithmic solutions, which represent the robot's functions. The technique will let the kitty "decide" on responses to stimuli.

The aptly named "evolvable hardware" mimics Darwin's theory of evolution, accord-



ing to Michael Korkin, director of Genobyte—the Boulder, Colorado-based company that's building the prototype for ATR. That is, the fittest algorithm survives. The team expects to complete the prototype by March.

Once ATR builds the brain, the project will turn to creating a robot that looks, feels, and sounds like a kitten. Hugo de Garis, team leader at ATR, plans to integrate neural modules for vision systems—most likely two color cameras—and for motion control. To detect when someone is near, the robot will have heat and touch sensors on its back, whiskers, and tail.

And the kitten's "meow" will express a range of emotions. Plans also call for two microphones and signal-processing chips to act as ears.

De Garis hopes the kitty will lead to bigger projects. His current brainchild is "J-Brain," a project to evolve an artificial brain with 10 million neural net modules. (The kitty's artificial brain will have a million neurons.) To fund the project, ATR wants to make the kitten's technology viable for kids' toys. Korkin says that if the robot is successful, its developers plan to shrink the system for other applications, such as robots that clean house.—Angela Hickman

JAKE KIRCHNER

## Technology and the Test of Time

**W**hen my grandmother was a little girl, in late-19th-century Washington, D.C., life was not much more "modern" than 50 years earlier during her grandmother's era. Although it's true that by the 1890s, electric lights, telephones, automobiles, and moving pictures had been invented, they were not common aspects of daily existence.

By the turn of the century, however, technology had sprung forward. And by the time my grandmother's children came along in the 1920s, airplanes were relatively common, radios were in widespread use, and television—and even fax technology—had been invented. When she sent her sons to war in Europe in the 1940s, digital computers and nuclear energy were alive in the laboratory and would soon be put to use.

About the time I and the rest of the baby boomers arrived on the scene at midcentury, integrated circuits were starting to find their way into a wide range of devices. Soon thereafter my grandmother could watch the news of the first manned space flights on her color television—my grandfather, a lifelong gadget freak, was one of the first "early adopters" of technology.

Today, almost half a century later, we speak of "Internet years" and marvel at the pace of technological development. So far the technologies underlying the microprocessor—the one great invention of my lifetime—have fostered an amazing range of products, from personal computers and communications satellites to cell phones and the Web. But although we're properly impressed with the computer era, it's not clear that future generations will think of the second half of the



20th century as equal to the first half in the scope of research and development and just plain inventiveness.

On November 7, Gertrude Mary Edinger Kirchner turns 100 years old. In two more years, God willing, she'll join her children, grandchildren, great-grandchildren, and great-great-grandchildren to watch the clock turn to a new millennium. That day she'll become one of the very few people ever to live in three different centuries. But no matter how many years she has left, in her lifetime she has already touched the

hands of family members whose lives will span 200 years of history and perhaps much longer. To me that's more awe-inspiring than the technologies that have helped make it possible.

Many things we think of as "new"—videoconferencing, WebTV, PCS systems—are really refinements of existing technologies, many of which date back to my grandmother's early years. But there's still room for truly new ideas and products. I expect the next 50 years will see significant advances in such fields as medicine, energy, and robotics—as well as even more interesting advances in microelectronics.

Will my grandchildren spend their "classroom" time in virtual three-dimensional worlds on the Web? Will my great-grandchildren be born in laboratories powered by clean fusion energy? I'm looking forward to seeing and experiencing the technology that will be a part of the lives of my great-great-grandchildren, but most of all I hope I get the same chance my grandmother has had to see and to touch *them*.



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- 16MB EDO DRAM (96MB max)
- Built-in 2.1GB Hard Drive, 16X max Variable Speed CD-ROM, 1.44MB Floppy Drive, and NiMH Battery
- 56Kbps\* Capable Integrated Modem
- Upgrade to 32MB RAM, add \$159
- Upgrade to 3.2GB Hard Drive, add \$249
- Lithium Ion Battery, add \$199
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- 233MHz Pentium Processor with MMX technology
- 13.3" XGA Active Matrix TFT Color Display
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- 3GB Hard Drive/20X max Variable Speed CD-ROM
- Upgrade to 96MB RAM, add \$699
- Upgrade to 5GB Hard Drive, add \$499
- 2nd Lithium Ion Battery, add \$199
- Versa Docking Station 6000 Plus, add \$869
- Upgrade to UltraCare Extended Service, add \$199

**\$4999**

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Code #V6234

### Versa 6220

- 200MHz Pentium Processor with MMX technology
- 13.3" XGA Active Matrix TFT Color Display
- 32MB EDO DRAM (128MB max)
- 2.1GB Hard Drive/20X max Variable Speed CD-ROM
- Upgrade to 64MB RAM, add \$299
- Upgrade to 3GB Hard Drive, add \$249
- Versa PortBar 6000 Port Replicator, add \$159
- Upgrade to UltraCare Extended Service, add \$199

**\$4299**

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Code #V6220

### Versa 6200MX

- 166MHz Pentium processor with MMX technology
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### Direction SPT233

- 233MHz Pentium processor with MMX technology
- 64MB SDRAM
- 6.4GB Ultra DMA Hard Drive
- ATX Motherboard with 430TX PCIset
- Number Nine Revolution 3D PCI, 8MB WRAM
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### Direction SPL266

- 266MHz Pentium II processor
- 32MB SDRAM
- 4.3GB Ultra DMA Hard Drive
- ATX Motherboard with 440LX AGPset
- Number Nine Reality 334 AGP, 4MB SGRAM
- Altec Lansing ACS-90 Speakers
- NEC C550 15" Monitor (14" viewable)
- Upgrade to Yamaha Wavetable Audio, add \$49
- Upgrade to NEC C700 17" Monitor (16" viewable), add \$219

**\$2299**

Business Lease: \$83/mo.  
Code #D5028

### Direction SPT200

- 200MHz Pentium processor with MMX technology
- 32MB SDRAM
- 3.2GB Ultra DMA Hard Drive
- ATX Motherboard with 430TX PCIset
- Number Nine Reality 334 PCI, 4MB SGRAM
- Altec Lansing ACS-90 Speakers
- U.S. Robotics x2 56Kbps\* Capable Modem
- NEC C550 15" Monitor (14" viewable)
- Upgrade to Creative Labs AWE32 Wavetable Audio, add \$49
- Upgrade to NEC C700 17" Monitor (16" viewable), add \$219

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## DESKTOP PCS

### Ultimate Management

In today's corporate PC market, the buzzword is management. Many of the industry's leading vendors are now shipping their machines with advanced DMI (Desktop Management Interface) solutions, allowing corporate administrators to inspect and monitor their clients from afar.

Developed by a consortium of industry leaders known as the DMTF (Desktop Management Task Force), the DMI specification—now in Version 2.0—is neither perfect nor ubiquitous, but as a whole it has made great strides over the past year. This fall, three stalwarts of the corporate market—Dell, Hewlett-Packard, and IBM—are offering new “managed” PCs that have proficient and useful DMI packages.

The **OptiPlex GXa** and the **OptiPlex Gn**, the two new corporate boxes from Dell Computer Corp. (800-388-8542, [www.dell.com](http://www.dell.com)), each ship with Dell Inspector 2.0, a management package that's compliant with the latest DMI specification. Inspector, which can be used locally on the client or on a remote server, provides a general overview of your PC's relevant characteristics (processor, BIOS, memory, drive, communication ports, and software). Details of the system's hardware and software are available in a detailed, modular DMI interface.

The **OptiPlex GXa** includes 32MB of EDO RAM, integrated S3 Trio graphics (2MB

to-access internal designs. The MMX Pentium/233-based OptiPlex Gn is a slimline desktop whose 24X max CD-ROM drive,



**DMI ARRIVES:** Corporate desktops from IBM (above) and Dell (below) feature DMI solutions.

standard floppy disk drive, and expansion-slot riser card can all be removed without using a screwdriver. A 3.2GB UltraDMA hard disk can be extracted with the removal of only a single screw.

The OptiPlex GXa, built around a Pentium II/266, also allows for the tool-free extraction of its 24X max CD-ROM drive and floppy disk drive. Furthermore, its internal drive bay cage, which houses a 3.2GB UltraDMA hard disk, and its power supply swing out on hinges to conveniently expose the motherboard.

The \$2,300 OptiPlex Gn includes 32MB of EDO RAM, integrated S3 Trio graph-

ics (2MB VRAM), a Creative Labs Sound Blaster audio card, and a 15-inch monitor. A step up is the \$3,200 OptiPlex GXa, which comes equipped with 64MB SDRAM, AGP graphics (ATI Rage Pro with 4MB SGRAM), integrated sound, and a 17-inch monitor. Both systems also ship with integrated 10/100 Ethernet and Altec Lansing speakers.

Hewlett-Packard Co. (800-752-0900, [www.hp.com](http://www.hp.com)) recently announced a new line of **Vectra VL** PCs, which are equipped with HP's TopTools management package and start at \$1,600. TopTools is perhaps the finest DMI solution on the market. In addition to providing a full system inventory, it can (on properly equipped Vectras) identify high motherboard temperatures, high system voltages, and fan failures. Administrators can even remotely update the BIOS of a Vectra client.

The high end of the new Vectra VL line, priced on the street at roughly \$3,360, includes a 300-MHz Pentium II processor, a 6.4GB hard disk, 64MB of EDO RAM, a Matrox Millennium II card, a 24X max CD-ROM, a Sound Blaster-compatible audio card, and a 10/100 Ethernet card. At the low end, a 166-MHz MMX Pentium-based Vectra VL with a

2.5GB hard disk, 16MB of EDO RAM, a Cirrus Logic graphics accelerator, and the same 24X CD-ROM sells for \$1,420.

Also available is the Pentium II/266 model, which is priced at about \$2,400 with a 10/100 Ethernet card, 32MB of EDO RAM, and a 2.5GB hard disk. The 200-MHz MMX Pentium model sells for \$1,650, with 32MB of EDO RAM and a 2.5GB disk.

The new **PC 300PL**, from IBM (800-426-4968, [www.ibm.com](http://www.ibm.com)), is an MMX Pentium/233-based system that sells for roughly \$2,650 on the street. It ships with a host of management software packages and management hardware devices, including IBM's LANClient Control Manager (LCCM) and NetFinity package and Intel's LANdesk Client Manager.

With LCCM and the PC 300PL's Wake on LAN card, administrators can remotely waken a sleeping machine and even update its BIOS. NetFinity provides network management features, but LANdesk provides DMI inventory and identification of high temperatures, high voltages, fan failures, and chassis intrusions. The Enhanced Asset Information Area, a dedicated section of dynamically readable memory, stores component serial numbers, which are valuable to have in times of hardware theft.

The PC 300PL is one of the first machines to use the new NLX motherboard form factor. After removing the system's tool-free chassis, you can easily slide the

motherboard out for servicing. The machine doesn't have much room for expansion, but it does have the Wake on LAN card and integrated Matrox Mystique graphics and integrated Crystal audio. The system also comes with 32MB of EDO RAM, a 15-inch monitor, and a 24X max CD-ROM drive.—Cade Metz





# Trends Software

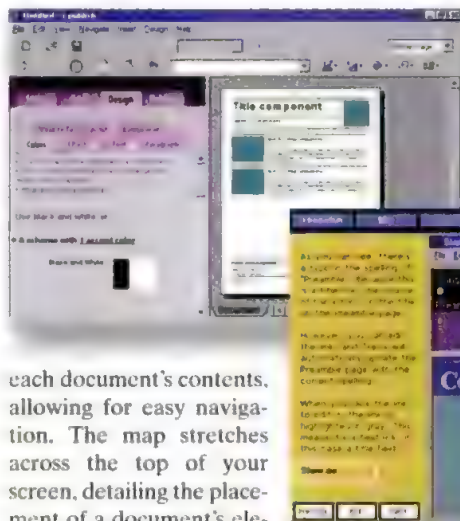
## PUBLISHING

### The Web Way

Like the rest of the software industry, publishing is being influenced by the Internet. Two examples, Trellix 1.0 and iPublish 2.0, are carving their own niches in the desktop publishing market.

The \$100 (street) **Trellix 1.0**, from Trellix Corp. (800-266-0879, [www.trellix.com](http://www.trellix.com)), replaces the conventional linear approach in publishing with a Web-style format, complete with links, color, and graphics. This way, you can easily "drill down" through a document or to linked Internet and intranet sites. You can create original content or incorporate text, spreadsheets, and presentation graphics from products such as Microsoft Office 97 or Lotus SmartSuite.

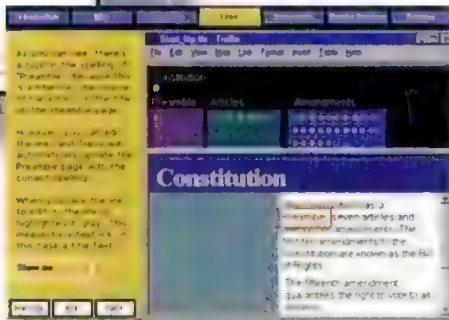
Trellix, which runs on Microsoft Windows 95 or Windows NT 4.0, offers a visual map of



each document's contents, allowing for easy navigation. The map stretches across the top of your screen, detailing the placement of a document's elements in a style similar to that of a timeline.

Design Intelligence has released **i publish 2.0** (\$89, electronic edition; \$99, CD-ROM edition), the second generation of this unique Internet publishing product (206-343-7797, [www.design-intelligence.com](http://www.design-intelligence.com)). New to this version is the integration of

**DESIGNER LAYOUTS:** New software packages from Design Intelligence (left) and Trellix (below) offer new tools for building documents.



Microsoft's Web browser, Microsoft Internet Explorer 3.01. By incorporating the browser into the software's interface, you can search for content on the Internet while designing and creating documents. The use of Microsoft Internet Explorer also enables i publish to benefit from

real-time technical support, Internet forums, answers to FAQs, news and reviews, and columns on topics of interest to Internet publishers.

i publish is compatible with Microsoft Windows 95 and Windows NT 4.0; the program has also added several interface enhancements. For example, you can now drag and drop pictures and text from your hard disk, your CD-ROM, and the Web. i publish then positions, alters, and resizes them with its auto-layout and auto-fit capabilities. Once you get the designs you want, i publish will automatically reformat them for the platform you choose: print, screen, or HTML Web page.

—Yvonne Koulouthros

**RECAP**

Read our First Looks review of i publish 1.0 in the PC Magazine issue of September 9, 1997.

## DESKTOP PUBLISHING

### A Path to Better Layouts

Although there is a lot of emphasis these days on Internet-related publishing, all's not quiet on the traditional desktop publishing front. Both Quark (303-894-8888, [www.quark.com](http://www.quark.com)) and Adobe Systems Inc. (408-536-6000, [www.adobe.com](http://www.adobe.com)) are offering brand new versions of their high-end desktop publishing packages.

Due out this fall is the \$995 **QuarkXPress 4.0**, the long-awaited upgrade to the most-popular graphics-industry stalwart. Now a full 32-bit product, QuarkXpress will be upgraded simultaneously for both the Macintosh and Microsoft Windows 95 and NT platforms.

**RECAP** PC Magazine reviewed desktop publishing software in the April 22, 1997, issue. Adobe PageMaker 6.5 was awarded an Editors' Choice.

With an improved interface that makes it easier to navigate and perform complex tasks, QuarkXpress is trying to reinvent itself as the essential desktop publishing tool for PC users. There are no less than 75 new features in all, including extra palettes and controls, more ways to view and navigate through your documents, numerous Bezier drawing tools, increased resolution, enhanced long-document support, and improved color management.

Concurrent with 4.0's release, Quark is offering **QuarkXPress Passport 4.0** (\$1,595 street). Also cross-platform, this package is designed for multilingual users and the international publishing world. There's now support for 11 languages: Danish, Dutch, French, German, International English, U.S. English, Italian, Norwegian, Spanish, Swedish,

and Swiss-German. Passport provides language-specific spell-checking, hyphenation, and justification along with typographic characteristics—for instance, smart quotes and special characters—that are unique to each of the specific languages.

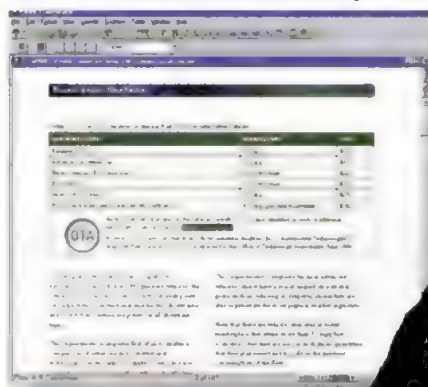
Also on the horizon is Adobe's **FrameMaker 5.5** (\$600

the corporate—rather than end-user—side of the desktop publishing spectrum.

FrameMaker 5.5 includes Adobe Acrobat 3.01, refined collaborative authoring, a streamlined "Smart Document" architecture, and improved cross-media publishing. It also provides drag-and-drop editing

enhancements, table sorting, font stretching, color support, and more.

This version of FrameMaker also provides wider support for



**CORPORATE PUBLISHER:** Adobe Frame

street). Designed primarily for use in publishing lengthy documents (of up to thousands of pages), this package focuses more on technical writing and



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*... and the Micron™ Millennia® brings it all home.*



# Packed Performer

Performance Desktop Solutions

## Introducing new and exciting features.

The Micron Millennia desktops tout the industry's highest awards for screaming performance and feature-packed configurations, making them the envy of our competitors.

Choose the Millennia XKU and you'll get an Intel Pentium® II processor with MMX™ technology. Not to mention an AGP-powered graphics for top-notch 3D performance, along with MPEG and 24X EIDE CD-ROM drive.

## Your choice of incredible software packs!

Now when you buy a Micron Millennia, you can pick one of four software packs to be included with your system. Choose from the Quicken Financial Pak, the EdVenture Pak, Multimedia Xcitement Pak, or the Home Productivity Pak. Pay only \$69 for each additional pack you choose.

## Included Zip drives.

The entire Millennia family comes standard with a 100MB Iomega Zip drive — giving you virtually unlimited storage! And you can easily transport files from home to work, saving and using multimedia files and applications. A Zip drive also gives you a built-in backup system for your computer.

## Giving it a boost with Fusion 3D™.

Upgrade your Millennia system with Fusion 3D and you'll get a DVD drive, incredible 3D graphics, AWE 64 ISA sound card, a two-speaker satellite with a subwoofer, an exciting game bundle and a Microsoft® SideWinder joystick. You won't believe how your games and multimedia applications spring to life like never before!

*How did the Millennia get so good? With the help of Micron's Consumer Products team left to right: Bob, Jon, Lori, Jeff, Tina, Christy, Rich, and Casey.*

**Call now to order.**  
**800-707-2329**  
**[www.micronpc.com](http://www.micronpc.com)**



**Configured For Your Life™**



# You Ask For Serious

*... we introduce Micron™ NetFRAME® servers  
and the ClientPro® MRE!*



# Business Solutions

Business Solutions

*Our Server and ClientPro Product groups mean big business. They are (clockwise from bottom): Amber, Jody, Tracey, Rex, Rob, Amanda and Todd.*



**The new Micron NetFRAME servers.** With the introduction of Micron NetFRAME servers, you'll get the latest server technology, custom-built for thousands less than you'd expect.

## **Building on a solid reputation.**

NetFRAME Systems has designed enterprise-class servers since 1987, delivering an unprecedented ability for businesses to use their networks for maximum advantages. So when Micron acquired the company this year, we were ready to build on NetFRAME's reputation and proven experience.

The Micron NetFRAME MV5000 server gives you the enterprise-level features at a mid-range price point. The MV5000 includes dual Pentium® II processors and a 440LX chip set, and embedded RAID. You'll get the security and high availability of fault-tolerant components including hot-swappable and redundant hard drives and power supplies. Our Micron NetFRAME LV2000 server delivers integration and stability at a low price.

## **ClientPro — there to take the challenge.**

Micron's dependable ClientPro systems are network-ready and can handle all your business computing tasks. These powerful desktop PCs are designed to be easy to set up and upgrade. Choose our new ClientPro MRE and usher in the next era of manageability. It's wired for management with new features like LANDesk 3.1 and Wake on LAN adapters, giving you the ability to remotely manage your system. You'll also get chassis intrusion alert for security protection. And because the ClientPro incorporates proven MMX™ technology, you'll know your ClientPro system will grow with you.

Micron's server and client product teams always bring you complete networking solutions. And you'll get Micron's award-winning customer service, 24-hour technical support, and a limited warranty that's hard to beat.

*Call now to order.*  
**800-707-2329**  
[www.micronpc.com](http://www.micronpc.com)



**Configured For Your Life™**



# You Want A Workstation To Beat All Others

*... we present the Powerdigm™ XSU with Micron-engineered technology!*



*Making it the workstation to beat are Powerdigm team members, left to right, Stephanie, Terry and John.*



## Micron innovation at its best.

Revolutionizing workstation performance, Micron introduces our exclusive Samurai™ chip set on the Powerdigm XSU workstation. A powerful, Intel processor-based workstation, the Powerdigm XSU will execute your most demanding business and technical tasks — and it's flexible enough to run the most popular PC programs.

Engineered and developed by Micron, the Samurai chip set is the first to offer a 64-bit PCI bus, in a system based on the Intel architecture. The Samurai chip set enables greater bandwidth for engineers, graphic designers and technical professionals who demand maximum throughput from their workstations and integrated peripherals.

Micron's workstation team makes sure your needs are covered. So the Powerdigm workstation supports dual monitors, dual Pentium II processors, multiple ultra-wide SCSI-3 hard drives and 10/100 network adapters. The Fire GL video cards offers no-compromise 3D performance and Jaz drives are standard on both the XSU and XLI Powerdigm models.

It's also hard to beat the industry-leading Micron Power limited warranty and our award-winning customer service and support. Call today and find out more about the Powerdigm XSU and XLI workstations.



# Business Solutions

Configurations

## NetFRAME® Lv2000

Intel 233MHz Pentium® II processor  
32MB ECC SDRAM  
2GB Ultra-Wide SCSI-3 hard drive  
Microsoft® Windows NT Server 4.0 (10-user license)  
Intel LANDesk® Server Manager 2.8  
NOS Support (3 incident resolutions/1st year), 7x24

### STANDARD FEATURES

Single or dual Intel Pentium® II processors  
512KB integrated Cache in SEC package  
ECC SDRAM option (4 DIMM slots)  
5 expansion slots: 4 PCI, 1 ISA  
Integrated Adaptec PCI Ultra Wide SCSI-3 controller  
Integrated Intel EtherExpress™ Pro 100 controller  
12X SCSI-2 CD-ROM drive  
10 drive bays: 4 external 5.25"/1 external 3.5"  
2 internal 5.25"/3 internal 3.5"  
Dedicated server technical support, 7x24  
5-year/3-year Micron Power™ limited warranty  
1-year next-business-day on-site service\*\*\*

**\$3,499**

Bus. Lease \$119/mo.

## NetFRAME Mv5000

Intel 300MHz Pentium II processor with ECC  
64MB ECC SDRAM  
4GB Ultra-Wide SCSI-3 hard drive  
Microsoft Windows NT Server 4.0 (10-user license)  
NOS Support (3 incident resolutions/1st year), 7x24

### STANDARD FEATURES

Single or dual Intel Pentium II processors with ECC  
512KB integrated Cache in SEC package  
Memory: ECC EDO or ECC SDRAM option (8 DIMM slots)  
9 open expansion slots: 6 PCI, 2 ISA, 1 shared ISA/PCI  
Dual integrated Symbios Ultra-Wide SCSI-3 controller  
Integrated Symbios Narrow SCSI controller  
Embedded RAID Upgrade option  
120 Compliant via embedded Intel i960-RD  
5 Internal, hot-pluggable, hard drive array bays (Upgradable to 10)  
1 (one) 360 watt hot-pluggable power supply standard  
(Upgradable to 3 for added redundancy)  
Rack Adapter Option  
Intel LANDesk Server Manager 2.8  
Dedicated server technical support, 7x24  
5-year/3-year Micron Power limited warranty  
1-year next-business-day on-site service\*\*\*

**\$6,199**

Bus. Lease \$195/mo.

## ClientPro® VXE

Intel 166MHz Pentium processor with MMX™ technology  
16MB EDO RAM, support for SDRAM  
1.2GB SMART EIDE hard drive  
15" Micron 500Lx, .28dp (13.7" display)

512KB pipeline burst cache, flash BIOS, DMI 2.0  
3Com 3C509 ISA Ethernet T-P NIC  
16X EIDE variable speed CD-ROM drive  
S3 ViRGE graphics accelerator, 2MB EDO RAM  
Microsoft Mouse  
Microsoft Windows® 95  
5-year/3-year Micron Power limited warranty

**\$1,449**

Bus. Lease \$49/mo.

## ClientPro MRE

Intel 200MHz Pentium processor with MMX technology  
32MB SDRAM  
2.1GB Ultra ATA SMART EIDE hard drive  
15" Micron 500Lx, .28dp (13.7" display)

512KB pipeline burst cache, flash BIOS, DMI 2.0  
Intel Pro/100 with Wake On LAN Network Adapter  
16X EIDE variable speed CD-ROM drive  
S3 ViRGE graphics accelerator, 2MB EDO RAM  
Microsoft Mouse  
Microsoft Windows 95  
Intel LANDesk Client Manager  
5-year/3-year Micron Power limited warranty

**\$1,749**

Bus. Lease \$60/mo.

## ClientPro XLU

Intel 266MHz Pentium II processor with MMX technology  
32MB EDO RAM  
2.1GB SMART EIDE hard drive  
17" Micron 500FGx, .28dp (13.7" display)

512KB internal L2 secondary cache, DMI support  
3Com PCI 10/100 ethernet NIC  
16X EIDE variable speed CD-ROM drive  
PCI 64-bit 3D video, MPEG, 4MB EDO RAM  
Upgradable wavetable audio with speakers  
Microsoft Intellimouse™  
Microsoft Windows NT Workstation  
Intel LANDesk Client Manager  
5-year/3-year Micron Power limited warranty

**\$2,649**

Bus. Lease \$90/mo.

\*\*\*On-site service for NetFRAME LV2000 and MV5000 server is provided by Digital Equipment Corporation and is optional.

Call now to order.  
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# Portable Solutions

## Micron TransPort™ VLX

133MHz Intel Pentium processor  
16MB EDO RAM (40MB max.)  
1.4GB hard drive  
16X modular CD-ROM drive  
Li-Ion battery  
12.1" TFT SVGA, 800x600 display  
256KB L2 pipeline burst cache  
PCI bus with 128-bit graphics accelerator  
MPEG compatible  
Zoomed video-ready  
Touchpad pointing device  
Microphone and 16-bit stereo sound  
2-way infrared port  
Modular floppy drive  
Microsoft Windows 95 and MS Plus!  
5-year/1-year Micron  
limited warranty

**\$2,249**

Bus. Lease \$77/mo.

## Micron TransPort XKE

### STANDARD FEATURES

512KB pipeline burst cache  
128-bit, 2MB DRAM graphics  
20X modular CD-ROM drive with AutoPlay™ technology  
Pick-a-Point dual pointing devices  
Microphone and 16-bit stereo sound  
Integrated 33.6 Kbps modem, full duplex  
CardBus- and zoomed video  
2 infrared ports, S-video, NTSC, game and MIDI port  
Management and Executive Travel software pak  
2 modular expansion bays  
Dragon System NaturallySpeaking voice recognition software  
Custom nylon carrying case  
Microsoft Windows 95 and MS Plus!  
Microsoft Office 97 Small Business Edition  
5-year/3-year Micron Power limited warranty

## Micron TransPort XPE

### STANDARD FEATURES

256KB pipeline burst cache  
PCI graphics accelerator, 2MB VRAM  
8X modular CD-ROM drive  
Pick-a-Point™ dual pointing devices  
Microphone and 16-bit stereo sound  
Motorola Montana 33.6 fax/modem  
CardBus- and zoomed video-ready  
2 infrared ports, S-video, NTSC, game port  
Management and Executive Travel software pak  
2 modular expansion bays  
Custom nylon carrying case  
Microsoft Windows 95 and MS Plus!  
Microsoft Office 97 Small Business Edition  
5-year/3-year Micron Power limited warranty

## Micron TransPort XPE 133

133MHz Mobile Intel Pentium processor  
with MMX technology  
16MB EDO RAM (80MB max.)  
1.6GB removable hard drive  
12.1" active matrix color display,  
800x600

**\$2,999**

Bus. Lease \$102/mo.

## Micron TransPort XPE 150

150MHz Mobile Intel Pentium processor  
with MMX technology  
32MB EDO RAM (80MB max.)  
1.6GB removable hard drive  
12.1" active matrix color display,  
800x600

**\$3,299**

Bus. Lease \$112/mo.

## Micron TransPort XKE 200

200MHz Mobile Intel Pentium processor  
with MMX technology  
48MB EDO RAM  
3GB removable hard drive  
13.3" TFT XGA display

**\$5,699**

Bus. Lease \$178/mo.

## Micron TransPort XPE 166

166MHz Mobile Intel Pentium processor  
with MMX technology  
32MB EDO RAM (80MB max.)  
2.1GB removable hard drive  
12.1" active matrix color display,  
800x600

**\$3,599**

Bus. Lease \$123/mo.

## Micron TransPort XKE 233

233MHz Mobile Intel Pentium processor  
with MMX technology  
48MB EDO RAM  
3GB removable hard drive  
13.3" TFT XGA display

**\$5,949**

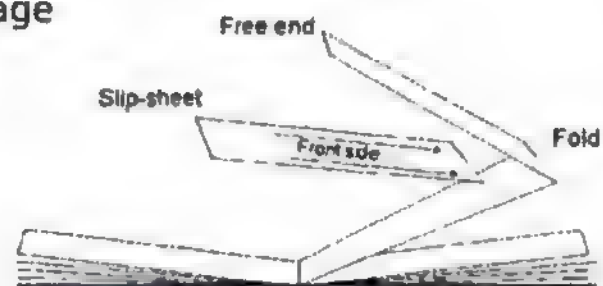
Bus. Lease \$187/mo.

*Call now to order.*  
**800-707-2329**  
**www.micronpc.com**

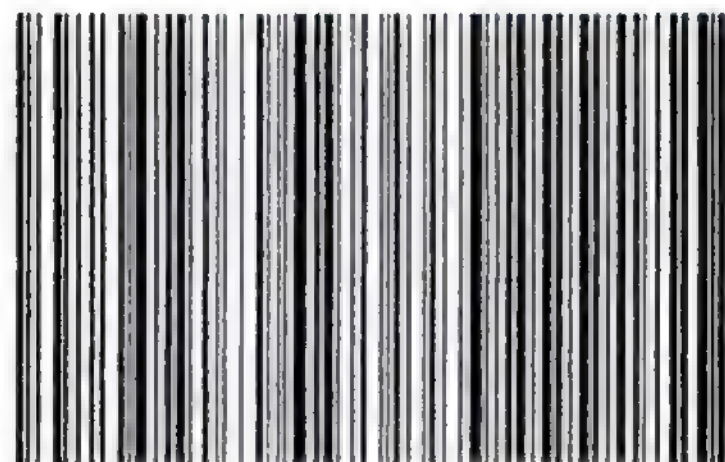


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1. Open the foldout page
2. Insert this sheet with
  1. Front side touching the free page
  2. Arrow pointing to the fold
3. Slice the folded edge
4. Close the page and slip-sheet



### Foldout slip-sheet



Inverted Foldout slip-sheet

Folded edge of the page

1. Open the foldout page

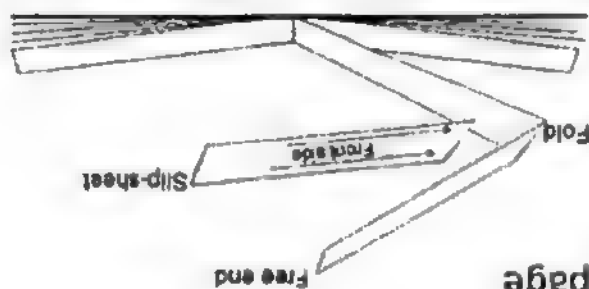
2. Insert this sheet with

1. Front side touching the free page

2. Arrow pointing to the fold

3. Slice the folded edge

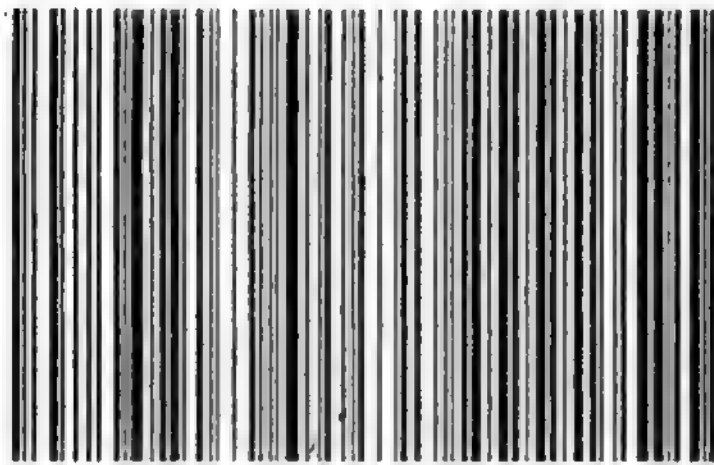
4. Close the page and slip-sheet





1. Follow instructions on the other side

Inverted Back



GbsSlipBack-0018

Back

1. Follow instructions on the other side

# Performance Desktop Solutions

## Millennia® MME

### STANDARD FEATURES

512KB pipeline burst cache, flash BIOS  
Integrated 100MB Iomega Zip drive, 3.5" floppy drive  
24X variable speed EIDE CD-ROM drive  
32 voice wavetable stereo sound with AV009 speakers  
USR Sportster 56K x2 data/fax modem\*  
PCI 64-bit 3D video, MPEG, 4MB EDO DRAM  
Microsoft® Intellimouse™, USB connections  
Microsoft Windows® 95 and MS® Plus!, Microsoft  
Office 97 Special Business Edition  
Choice of Micron Software Solutions Pak  
5-year/3 year Micron Power™ limited warranty

## Millennia MME 166

Intel 166MHz Pentium® processor with MMX™ technology  
16MB SDRAM  
3.2GB Ultra ATA hard drive  
15" Micron 500FGx, .28dp  
(13.7" display)

**\$1,699**

Bus. Lease \$58/mo.

## Millennia MME 200

Intel 200MHz Pentium processor with MMX technology  
48MB SDRAM  
4GB Ultra ATA hard drive  
17" Micron 700FGx, .26dp  
(16" display)

**\$2,249**

Bus. Lease \$77/mo.

## Millennia MME 233

Intel 233MHz Pentium processor with MMX technology  
64MB SDRAM  
6.4GB Ultra ATA hard drive  
17" Micron 700FGx, .26dp  
(16" display)

**\$2,599**

Bus. Lease \$89/mo.

## Micron Software Solutions Paks

**Quicken Financial Pak:** Quicken Deluxe, Family Lawyer, Parent's Guide to Money, Financial Planner†

**EdVenture Pak:** Includes children's educational and entertainment software, age 3-10†

**Home Productivity Pak:** Family Doctor, Comptons Encyclopedia 1997, Mavis Beacon Teaches Typing, Printshop Ensemble 3, Net Nanny, Crayola Magic 3D†

**Multimedia Xcitement Pak:** Includes great multimedia titles the whole family will love! Call for details on titles.

## Millennia XKU

### STANDARD FEATURES

82440LX chipset  
512KB internal L2 cache, 2MB BIOS  
Integrated 100MB Iomega Zip drive, 3.5" floppy drive  
24X variable speed EIDE CD-ROM drive  
32 voice wavetable stereo sound with Advent 009 speakers and subwoofer  
USR Sportster 56K x2 data/fax modem\*  
Diamond Viper V330 128-bit 3D video with 4MB SGRAM  
Microsoft Intellimouse, USB connections  
Microsoft Windows 95 and MS Plus!, Microsoft Office 97 Special Business Edition  
Choice of Micron Software Solutions Pak  
5-year/3 year Micron Power limited warranty

## Millennia XKU 266

Intel 266MHz Pentium II processor  
(features MMX technology)  
64MB SDRAM  
6.4GB Ultra ATA hard drive  
17" Micron 700FGx, .26dp  
(16" display)

**\$3,099**

Bus. Lease \$106/mo.

## Millennia XKU 300

Intel 300MHz Pentium II processor  
(features MMX technology)  
128MB SDRAM  
8.4GB Ultra ATA hard drive  
17" Micron 700FGx, .26dp  
(16" display)

**\$3,999**

Bus. Lease \$136/mo.

## Fusion 3D Option Pak

DVD-ROM, \*\*DVD software  
E4 Cool DVD PCI decoder card: 6 channel AC-3 to 2 channel out capability, SPDIF output (digital audio out)  
AWE 64 ISA sound card  
Cambridge SoundWorks/MicroWorks - 2 speaker satellite with subwoofer stereo system  
Monster 3D graphics card with 4MB memory  
Fusion 3D game pak: Mech Warrior 2: Mercenaries 3Dfx version, AH-64 Longbow, U.S. Navy Fighters '97, Command & Conquer, Formula 1 3Dfx Edition  
MS Sidewinder™ Pro Joystick

**MME add \$699  
XKU add \$549**

\*\*The DVD ROM drive will be removed upon the purchase of the DVD upgrade





# Workstation Solutions

## Powerdigm™

### STANDARD FEATURES

12/20X variable speed SCSI CD-ROM drive  
4GB Ultra-Wide SCSI-3 hard drive  
Supports multiple IDE Ultra ATA and Ultra-Wide SCSI-3 hard drives  
DMI, software and hardware management support  
Iomega Jaz SCSI drive with 1GB removable cartridge  
Wavetable stereo sound with speakers  
Fast Ethernet 10/100 PCI network adapter  
Microsoft Intellimouse  
Microsoft Windows NT Workstation  
19" Hitachi SuperScan CM751(18" display) 26dp color monitor  
Optional support for dual monitors  
5-year/3 year Micron Power limited warranty

## Powerdigm XLI

Dual Intel 200MHz Pentium Pro processors  
64MB ECC EDO RAM  
Memory upgradable to 512MB ECC EDO RAM  
Number Nine Revolution 3D  
video card, 4MB WRAM

**\$4,899**

Bus. Lease \$167/mo.

## Powerdigm Xsu

Samurai™ Chip set  
Dual Intel 300MHz Pentium II processors  
64MB ECC SDRAM  
Memory upgradable to 1GB ECC SDRAM  
Fire GL 1000 pro 8MB 66MHz PCI  
Open GL Professional  
3D accelerators

**\$6,199**

Bus. Lease \$195/mo.

# Other Systems Options

## MultiMedia Options

|                                                                 |       |
|-----------------------------------------------------------------|-------|
| AWE 64 ISA Sound Card upgrade                                   | \$99  |
| Advent AV370 Powered Partners<br>stereo speakers with subwoofer | \$199 |
| Microsoft SideWinder™ 3D Pro joystick                           | \$59  |
| Microsoft SideWinder gamepad                                    | \$39  |

## Storage/Media Options

|                                                                    |       |
|--------------------------------------------------------------------|-------|
| Adaptec 2940U Ultra SCSI<br>Fast-20 controller                     | \$100 |
| upgrade from system with standard Ultra SCSI Fast-20 controller:   |       |
| Plexor 12/20 Plex 3MB/sec SCSI<br>internal CD-ROM drive*           | \$100 |
| upgrade from system with standard EIDE CD-ROM drive:               |       |
| Iomega Jaz SCSI drive with<br>1GB removable cartridge*             | \$299 |
| Iomega Zip IDE drive with<br>100MB removable cartridge             | \$99  |
| Iomega 3-pack of 100MB Zip cartridges                              | \$99  |
| Iomega 3-pack of 100MB Zip cartridges                              | \$49  |
| Sony 4/8GB SCSI DDS-2<br>tape backup drive with tape and software* | \$899 |
| Cheyenne ARCserver with InocuLAN                                   | \$499 |

## Display/Video Options

|                                                               |       |
|---------------------------------------------------------------|-------|
| 17" Hitachi SuperScan CM630<br>(15.9" display) .26dp monitor* | \$100 |
| 19" Hitachi SuperScan CM751<br>(18" display) .26dp monitor*   | \$300 |
| 21" Hitachi SuperScan CM801<br>(20.0" display) .26dp monitor* | \$650 |

## Software Options

|                                                                                                                   |       |
|-------------------------------------------------------------------------------------------------------------------|-------|
| Small Business Essentials: QuickBooks,<br>Visio, Norton AntiVirus, Astound,<br>Focal Point, American Yellow Pages | \$249 |
| CorelDRAW 7 (full retail version)                                                                                 | \$299 |
| Corel WebMaster Suite (full retail version)                                                                       | \$99  |

## HP Printers

|                           |       |
|---------------------------|-------|
| HP Deskjet 692c printer   | \$319 |
| HP Deskjet 870Cxi printer | \$419 |
| HP Laserjet 6Lxi printer  | \$429 |
| HP Laserjet 6P printer    | \$799 |

## Scanner Options

|                                |       |
|--------------------------------|-------|
| HP Scanjet 5a sheetfed scanner | \$209 |
| HP Scanjet 5p flatbed scanner  | \$309 |
| HP Scanjet 6100C               | \$799 |

## Communication Options

|                                  |       |
|----------------------------------|-------|
| 33.6 external data/fax modem     | \$299 |
| 56Kbps technology modem* upgrade | \$99  |

## Server Extended Service Options

|                                                                                   |       |
|-----------------------------------------------------------------------------------|-------|
| 2nd and 3rd year next-business-day*<br>on-site service coverage*                  | \$99  |
| 4-Hour response* on-site service coverage*<br>(8am - 5pm, M-F), 3 year            | \$798 |
| 4-Hour response* on-site service coverage*<br>(24 hours, 7 days per week), 3 year | \$998 |
| Other service options may be available.<br>ask your system consultant             |       |

## Extended Desktop Service Options

|                                                                       |      |
|-----------------------------------------------------------------------|------|
| Optional 1st year on-site service* coverage included                  |      |
| 2nd year on-site service* coverage                                    | \$79 |
| 2nd and 3rd year on-site service* coverage                            | \$99 |
| Other service options may be available.<br>ask your system consultant |      |

## Extended VIX Notebook Service Options

|                                                                             |       |
|-----------------------------------------------------------------------------|-------|
| 2nd and 3rd year parts and labor; 3-business-day<br>turnaround for 3 years* | \$269 |
| 2nd and 3rd year parts and labor; 7-business-day<br>turnaround for 3 years* | \$209 |

## TransPort Options

Micron Executive™ desktop package:  
matching black 17" monitor (15.8" display),  
mouse, mousepad and keyboard (can be used  
with or without MicronDock. Available on X86  
and X86 models only.) \$699

## Other Options

|                                                               |      |
|---------------------------------------------------------------|------|
| APC Per/TT surge suppressor                                   | \$39 |
| APC Pro/TT surge suppressor                                   | \$59 |
| Microsoft Natural Keyboard<br>upgrade from standard keyboard* | \$49 |

\* Requires SCSI host adapter  
\* Upgrade from system with standard Micron 17" 17FGx color monitor  
\* 1st year on-site service is available in the United States and in limited  
areas in Canada from third-party service providers per customer's  
agreement with provider  
\* 2nd year and 3rd year offerings are available in the  
United States only. Extended service, if purchased after system  
shipment may have a higher cost.  
\* Service will be scheduled whenever possible, for the next business  
day after parts are received by the customer.  
\* Available in certain locations. ask your system consultant for details.  
Some options and accessories available with system purchase only.



Call our sales team  
today! Left to right:  
Felice, Brian, Fred,  
Justin, Bruce  
and Ron.



5-year limited warranty on microprocessor and main memory  
3-year limited parts-only system warranty (1-year for TransPort V15)  
1, 2 or 3-year optional on-site service agreement for Micron desktop and server systems  
30 days of free Micron-supplied software support for Micron desktop systems; 3 optional  
network support system incident resolutions included for Micron server systems  
30-day money back policy  
24-hour technical support  
The foregoing is subject to and qualified by Micron's standard limited warranty and terms  
and conditions of sale. Terms and conditions of sale may vary for specific configurations.  
Copies of the limited warranty may be obtained on our Web site or by calling Micron.

Micron Sales Hrs: Mon-Fri 6am-10pm.  
Sat 7am-5pm (MT) Technical Support Available 24 Hours  
A Day, 7 Days A Week  
Toll free from Mexico: 95-800-708-1755  
Toll free from Canada: 800-708-1758  
Toll free from Puerto Rico: 800-708-1756  
International Sales: 208-893-8970  
International Fax: 208-893-7393

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Systems, Inc. Other product names used in this publication are for identification purposes only and may be trademarks of their respective companies.

\*Maximum transmission speed of up to 56Kbps when downloading data and 33.6Kbps when uploading. However, actual performance is  
dependent upon numerous factors and observed transfer rates may be less than the maximum potentials.

Available only on Millennium systems with Microsoft Windows 95

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# Trends Peripherals

## SCANNERS

### Affordable Color Imaging

Prices for entry-level color flatbed scanners have been dropping steadily for over a year, and they've now reached the point of affordability for many first-time buyers. If you're interested in this market but have a budget to meet, these new offerings should pique your interest. Take a look at this issue's First Looks roundup for reviews of some of the latest 30-bit SOHO scanners.

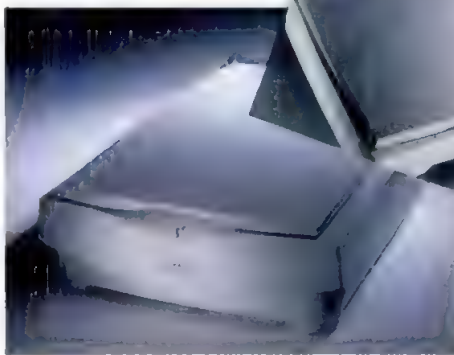
The \$300 (street) **Perfection 600**, from Epson America (800-463-7766, [www.epson.com](http://www.epson.com)), is a 30-bit color flatbed scanner with an optical resolution of 600 dpi. One of its differentiating factors is its legal-

size (8.5- by 15-inch) scanbed.

The generous software bundle makes this scanner a great choice for both novice and expert users. Along with Epson's LaserSoft scanner driver, it includes Visioneer PaperPort, Adobe PhotoDeluxe, Xerox TextBridge, Adobe PageMill, and Earthlink's Total Access with Netscape Navigator. Compatible with both Windows and Macintosh operating systems, the scanner also has an Adaptec add-on card for hook-up to a PC with a SCSI bus.

Umax Technologies (800-562-0311, [www.umax.com](http://www.umax.com)) has recently added the **Astra 600P** to its line of

scanners. This 300-dpi single-pass 30-bit flatbed scanner costs \$200 (street) and is targeted at the SOHO market. It comes with Adobe PhotoDeluxe and Newsoft's Presto!PageManager. Fully Twain-compliant, the Astra provides color and effects adjust-



**CAPTURED:** New 30-bit scanners from UMAX and SPOT InnoScan (upper right).

**600S**, a \$250 (street) solution for SOHO users. With the same specs and software as the Astra 600P (30-bit, 300-dpi resolution), the Astra 600S also integrates Kodak's Color Management Software with Umax's MagicMatch, which help maintain color accuracy as data moves from the scanner to the monitor to the printer. Like the Epson scanner, both Umax units can accommodate legal-size (8.5-inch by 14-inch) paper.

A familiar name in the dedicated photo-scanner market, Storm Technology (888-438-3279; [www.stormtech.com](http://www.stormtech.com)) joins the flatbed revolution with its **EasyPhoto ImageWave**. Priced at \$200 (street), the ImageWave has a maximum optical resolution of 600 dpi, and it also has a letter-size scanbed. The cover is removable, which makes it easier to scan thick items.

ments by way of its user interface, Umax's Intelligent Vista Scan.

Also from Umax is the **Astra**

cludes a warranty providing for 24-hour exchange during the first year in the event your printer malfunctions.

Similarly, JetFax (800-753-8329, [www.jetfax.com](http://www.jetfax.com)) is offering the M900 line of multifunction printers. Each of the three models in the series uses the same LED print engine as the OkiOffice 44. Also, each printer has a print resolution of 600 dpi and a rated speed of 8 ppm. The JetFax units also provide standalone copying and faxing along with monochrome scanning at 300 dpi. The units come equipped with the company's JetSuite software, which facilitates printer management.

The \$2,595 **JetFax M910** features a single 14.4-Kbps fax line, and the \$2,995 **JetFax M920** has two separate 14.4-Kbps lines. If you are a high-volume user sending faxes to a location equipped with a 33.6-Kbps fax line, then the \$2,995 **MJetFax M930**—which has a single 33.6Kbps fax line—is the right printer for you.—JL

Storm's ClearScan II technology manages brightness and color stability, and the company's ClearPrint technology maintains color accuracy during data transmission to the printer. Bundled software includes Xerox's TextBridge and DocuMagix PaperMaster. By the end of the year, Storm will be offering a USB attachment for the scanner.

SPOT InnoScan (714-434-6743, [www.spotinc.com](http://www.spotinc.com)), a division of Taiwan's MAG Technology, joins the fray with the release of the 30-bit **Dynotak-6P** SOHO flatbed scanner, priced at \$150 (street). The compact design gives the scanner a small footprint, a light weight, and a quiet motor. This Microsoft Windows-compatible unit comes with SPOT's TouchScan feature; two buttons on the side of the scanner bring up an options menu on your monitor. The single-pass unit has an optical resolution of 300 dpi and is Twain-compatible. Bundled software includes SPOT's own ScanOffix, LivePix SE for image editing, and Kai's PowerGOO, from MetaTools.—Josh Levy

## MULTIFUNCTION PRINTERS

### A Machine for Every Purpose

Multifunction printers are steadily gaining in popularity, finding their way into such disparate areas as print-savvy families and enterprise-class networks. If you ever need to print, scan, fax, and photocopy (but you want to save money and desk space), then you are a prime candidate for a multifunction printer. We take a look at nine multifunction printers from the five largest vendors in this issue's Personal Printers cover story, but there are many more offerings.

The **OkiOffice 44**, from Okidata (800-654-3282, [www.okidata.com](http://www.okidata.com)), combines a monochrome

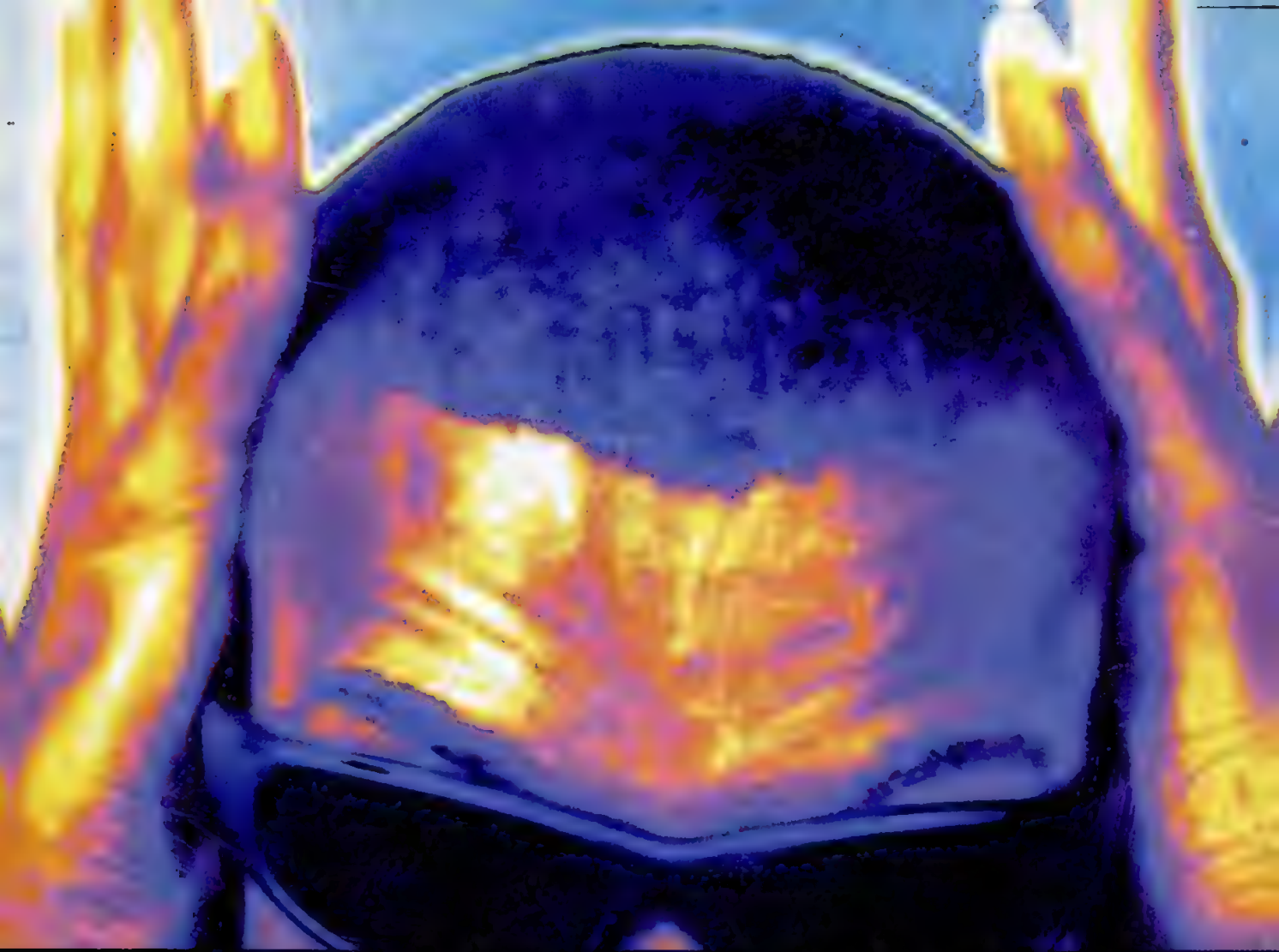
LED printer with a high-speed fax, scanner, and copier. Designed for SOHO users, large offices, or branch offices, the OkiOffice 44 (\$600 street price) generates laser-quality printing at 600-dpi resolution with a rated print speed of 4 ppm. The standalone fax machine and copier (which can produce as many as four copies per minute) performs independently of your PC's connection; the scanner is able to generate 200- by 400-dpi prints.

The OkiOffice is bundled with Okidata's JetSuite multifunction software. Okidata in-



**NOT JUST THE FAX:** JetFax's M900 line of multifunction printers.





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## E-COMMERCE

### Internet Shrinkwrap

So you've got a great new software package, and the global Internet seems like the perfect marketplace. But users are notorious for wanting to try before they buy, and the hassles of double downloads—one for a trial version and one for the real thing—can cut down on sales. Your solution may lie in one of these four electronic software distribution (ESD) solutions, which let you create a virtual shrinkwrap that enables software to handle purchasing and tracking.

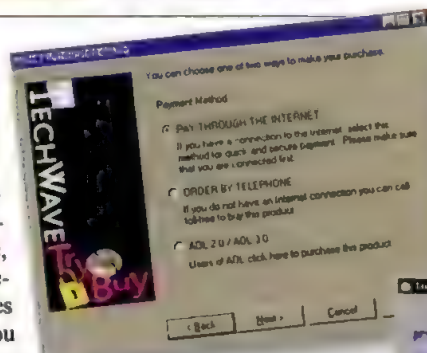
Release Software (415-833-0200, [www.releaseoft.com](http://www.releaseoft.com)) offers software publishers a full-service ESD solution utilizing the company's own **SalesAgent** technology. Release will ESD-enable your products, host downloads, securely process subsequent transactions, and track end-user license agreements. You can designate time- or features-limited trials for your ap-

plications and let customers pay via the Internet, Touch-Tone phone, or fax. The cost of Release's ESD service varies based on the services you require, but it starts at a per-transaction fee of about

10% of the software's selling price.

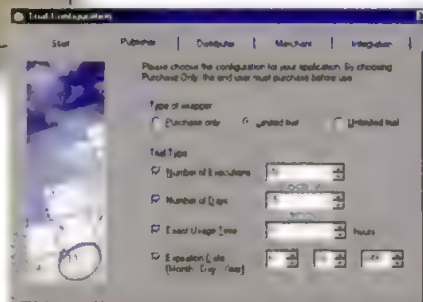
Using patented encryption and unlocking technology, **TestDrive** Corp. (415-237-6700, [www.testdrive.com](http://www.testdrive.com)) shrinkwraps the software you're selling according to the trial-usage terms you specify. You then use the **TestDrive/Internet** package, which includes such components as a Merchant Toolkit and Commerce Server Extensions, to customize your product for price and documentation changes and to manage and record transactions. The cost is a server license fee of \$25,000 plus per-transaction fees.

#### TestDrive



Available by the fourth quarter of this year, **TechWave Internet ESD Server**, from TechWave (888-832-4928, [www.techwave.com](http://www.techwave.com)), lets you ESD-enable software within a branded, RSA-encrypted container; manage price and marketing information; and oversee multiple Web storefronts. You can offer timed or numbered trials to customers, and you can change prices and special promotions on the fly. TechWave's proprietary TryAndBuy technology travels with the products you shrinkwrap, so software that a customer passes along to a friend becomes reactivated as a

trial copy with purchase options. The price for the Internet ESD Server has yet to be determined. **timeLOCK 3.0**, from Preview Software ([www.previewsoft.com](http://www.previewsoft.com)), is a complete client/server system for ESD (single license, \$795; \$495 for each additional li-



**INTERNET TRIALS:** TechWave (left) and Preview Software let you try before you buy.

cense). Using the Client Builder, you can quickly integrate e-commerce and try-before-you-buy functionality into an application. The Transaction Server, available for Microsoft Windows NT 4.0 and Solaris 2.5.1, processes transactions using RSA encryption.—**Brett Krasnowe**

## INSTANT MESSAGING

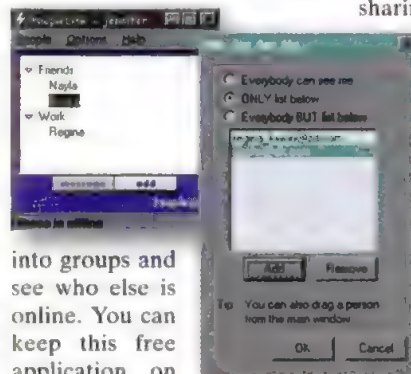
### The Human Connection

Tired of chasing people around the office or waiting for them to read your e-mail? Three applications have now joined the burgeoning instant-messaging market, adding to your options for communicating online in real time.

Activeverse's (512-708-1255, [www.activeverse.com](http://www.activeverse.com)) **Ding!** "People Browser" lets you organize your contacts into groups, see who else is online, indicate to others whether you are available to chat, transfer files and URLs, and track messages. You can initiate multiparty chat as well as private messages. Ding! will notify you if a user to whom you have sent a message is offline, and it will let you reroute your message to that user's e-mail address. You can download Ding! (along with the Java Run-

time Environment required for it to run) for free from Activeverse's Web site.

Like Ding!, **PeopleLink** (310-581-4299, [www.peoplelink.com](http://www.peoplelink.com)) lets you organize your user list



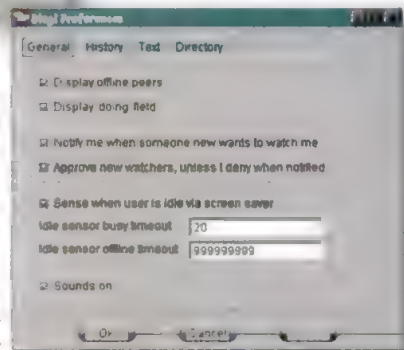
**CHAT IN A FLASH:** PeopleLink helps you stay in touch.

into groups and see who else is online. You can keep this free application on your desktop at all times, set an "away" response

to incoming messages, and restrict your visibility to certain users; you can also export your user lists to friends. **PeopleLink**—whose parent company, idealab!, also owns the CitySearch Web regional guides—offers a revenue-sharing program for organizations with a high level of PeopleLink participation.

**PeerChat**, a simple shareware chat application developed by Claudin Lambert, runs in both English and French and requires you to know the IP addresses of those with whom you wish to chat. You can save session transcripts and set sound, color, and text format. Version 1.03,

due by the end of this year, adds such functional features as an address book. PeerChat is available from FTP and software-download sites as well as



**WATCH THIS SPACE:** See what others are doing online with Ding!'s Watcher List.

the author's homepage (which is at [www.geocities.com/SiliconValley/Way/9831/preview13.html](http://www.geocities.com/SiliconValley/Way/9831/preview13.html)); the software is free for a 30-day trial, after which you are asked to pay an \$8 registration fee.—**Jennifer L. Anderson**



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|---------|------------------------------|------------|------------------|---------------|-----------|--------------|--------------------|
| 5010ECX | 233MHz Pentium® Processor    | 3.1GB HDD  | 64/128 MB RAM    | 14.1" XGA TFT | 56K Modem | 20X CD-ROM   | \$5295.00          |
| 5000ECX | 233MHz Pentium® Processor    | 3.1GB HDD  | 32/128 MB RAM    | 14.1" XGA TFT | 56K Modem | 20X CD-ROM   | \$4895.00          |
| 3020ECX | 233MHz Pentium® Processor    | 3.1GB HDD  | 64/128 MB RAM    | 14.1" XGA TFT | 56K Modem | 20X CD-ROM   | \$5295.00          |
| 3010ECX | 200MHz Pentium® Processor    | 3.1GB HDD  | 64/128 MB RAM    | 14.1" XGA TFT | 56K Modem | 20X CD-ROM   | \$4995.00          |
| 3000ECX | 166MHz Pentium® Processor    | 3.1GB HDD  | 32/128 MB RAM    | 14.1" XGA TFT | 56K Modem | 20X CD-ROM   | \$4495.00          |



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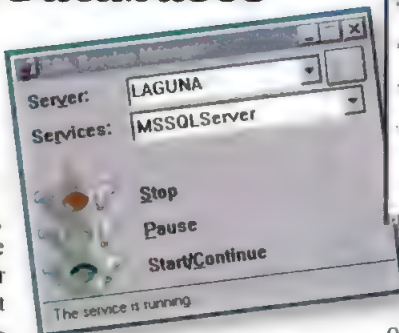
## DATABASES

### Enterprising Databases

Organizing enterprise-wide data has always been a tall order. New versions of popular database software from industry leaders Oracle Corp. (800-672-2531, [www.oracle.com](http://www.oracle.com)) and Microsoft Corp. (800-426-9400, [www.microsoft.com](http://www.microsoft.com)) are on the way with new features, greater flexibility, and the power to meet the demands of an ever-changing market.

Oracle's vision of Network Computing Architecture posits a three-tiered client-server structure of slim clients served by applications and database servers. To service the database side of the equation, Oracle has introduced **Oracle8** and **Oracle8 Enterprise Edition**; the latter provides expanded support for larger networks and mission-critical applications.

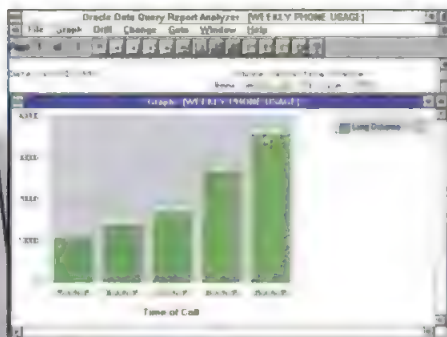
One of the goals of Oracle8 is to lower the overall administrative costs for networks. New features include data partitioning, server-managed backup and recovery, and a Web-based central management console; working in tandem, these features lower the total memory requirement per user by 30 to 60 percent and improve performance.



Oracle8 also utilizes object-oriented programming languages to speed deployment and ease maintenance of complex applications. It also features new performance optimizations, faster query mechanisms, and parallel operations for performing bulk inserts, updates, and deletions.

Microsoft's **SQL Server 6.5, Enterprise Edition**, is optimized to work with Microsoft Windows NT Enterprise Edition (4.0 or higher) and is fully integrated with the MS BackOffice Enterprise Edition family. SQL 6.5 is still in beta as of this writing, and Microsoft has not yet set pricing. It is due for release by the end of the year.

Packed with a wealth of new features, this version builds on the symmetric multiprocessor (SMP) server scalability of earlier versions



**THE NEXT HORIZON:** New databases from Microsoft (left) and Oracle (above).

of SQL. The standard edition is optimized for use on a four-processor SMP server, and the Enterprise Edition is designed and licensed to work with the new class of up to four-processor servers.

The Enterprise Edition offers support for MSCS (Microsoft Cluster Server), formerly known by the codename Wolfpack. MSCS protects critical applications from hardware faults in high-availability cluster configurations. It also offers support for NT Server Edition 4GB RAM Tuning (4GT). This lets SQL address up to 3GB of real memory to bump up performance speed on 32-bit Intel architecture servers. Future releases should be able to support 64-bit processors. —Michael N. Rusignuolo

## INTRANET

### Pushing Back

Despite efforts at streamlining, push content continues to hog bandwidth and cause network slowdowns. Coming to the rescue are two new products that offer different approaches to the same problem.

For preventative medicine, there's Ganymede Software's testing program, **Chariot 2.1** (919-469-0997, [www.ganymede-software.com](http://www.ganymede-software.com)). New performance scripts are now available for Chariot, giving network managers the power to emulate traffic caused by push products (such as PointCast, BackWeb, and Marimba) in order to see how they will affect their systems.

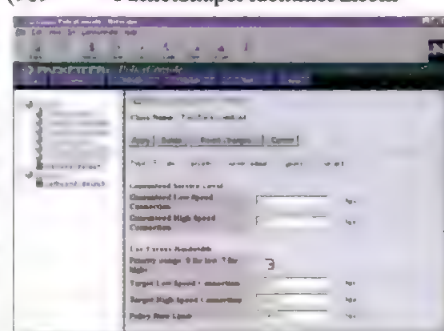
Pricing for Chariot starts at around \$11,000. For current Chariot users, the new scripts are available as free downloads from Ganymede's Web site.

The scripts illustrate how push content will delay response times for specific network applications. They also display the increase in bandwidth usage as more users access push content. Chariot helps you determine the best con-

figuration and delivery method of push content, minimizing the network's performance hit.

Packeteer's product, **PacketShaper 2.0** (\$7,250 list), offers administrators the tools they need to prioritize bandwidth by IP address, application type, and URL (408-364-0197, [www.packeteer.com](http://www.packeteer.com)). Free modules are available for controlling major push content formats (including PointCast, Castanet, BackWeb, Java, and CDF).

PacketShaper identifies incom-



**CONTROLLING THE PUSH:** PacketShaper 2.0.

ing push content and then assigns it excess bandwidth to prevent delay of priority content, such as an e-mail message. The modules can classify content based on URL, so a company's internal PointCast channel can be set to high priority while all other push channels are sent to the back of the bandwidth bus. —MNR

## FILTERING SOFTWARE

### Mary Poppins Does Networking

Need a babysitter for your network? Net Nanny (800-340-7177, [www.netnanny.com](http://www.netnanny.com)) can do the job with the network version of **NNPro**, its popular content-screening program (\$20 per workstation).

Based on keyword filters, NNPro can block content from Web sites, newsgroups, chat rooms, e-mail, or file transfers. For added security, you can monitor all incoming and outgoing information according to criteria set by a manager.



To keep things simple, you can set up lists of sites designated as "Can Go" and "Can't Go". You can also modify the free downloadable databases available at Net Nanny's Web site. NNPro's flexibility lets you monitor, log, or warn violators. You can even mask offensive text or shut down the application causing the violation. NNPro can run on any Novell or NT servers running Windows 3.x or 95 clients. —MNR

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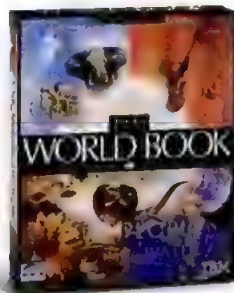
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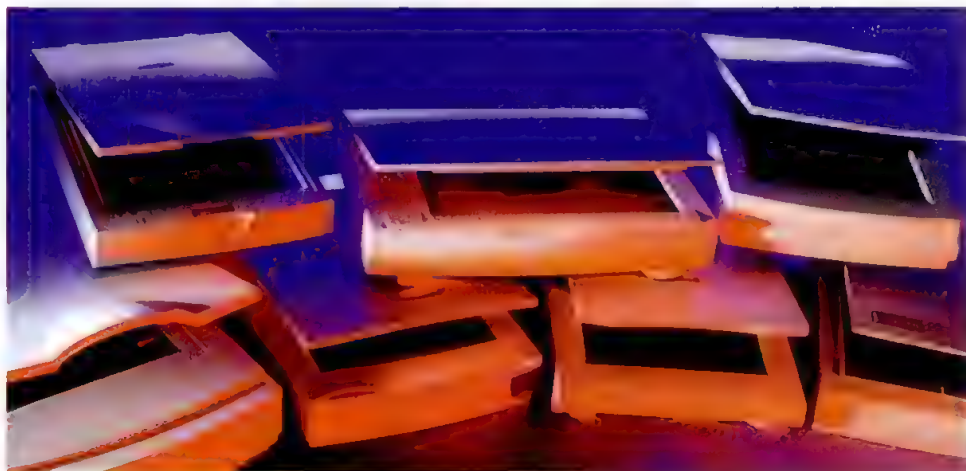


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# First Looks



## Value-Minded Flatbeds

*Scanners have never before been so affordable, as these seven reasonably priced color flatbeds prove.—By Daniel Grotta and Sally Wiener Grotta.*

**O**ver the course of the past year, the market for color flatbed scanners has shifted. No longer do vendors solely embrace graphics professionals; instead, everyone is scrambling to meet the increased demand for affordable scanners in the growing consumer and SOHO markets. Having a flatbed scanner is not only chic, it's now a necessity.

The improved output quality of ink jet printers has been a driving impetus behind the demand for flatbed scanners: Now that you have a means of producing output that borders on photorealistic quality, you need a means to input your photos and documents.

The latest generation of entry-level color flatbeds reflects this shift: They're smaller, lighter, easier to operate, and less expensive than ever before. For this roundup, we tested seven entry-level, 30-bit scanners ranging in price from an incredible \$100 to a high of \$400. The units featured here

are from Artec/Ultima International, Bayer Corp.'s Agfa Division, Fidelity Imaging Solutions (a division of Mustek), Info Peripherals, Plustek, Visioneer, and Vivitar. The scanners from Fidelity and Vivitar both use the same optics and internal hardware (manufactured by Mustek).

Four other affordable 30-bit flatbed scanners (from Epson America, SpotInnoscan, Storm Technology, and Umax) didn't ship in time to be included in this review. You can learn more about these products in this issue's Trends *Hardware* section.

### BIT BY BIT

Upping color depth from 24 bits to 30 bits lets the analog-to-digital converter resolve 30 bits of data (ten each per red, blue, and green channel). This results in less data loss and a better image that has more detail in hue, highlights, and shadow. Nonetheless, the greater bit-depth sampling is more important for high-end

scanners, which are used with professional imaging software and output to expensive image setters. Although images may be scanned at 30 bits, the scanner software determines which 24 bits out of 30 bits have the best shadows and highlights.

Optical resolution is just as hyped and misunderstood as bit depth. The scanners in our roundup have resolutions ranging from 300 dots per inch (dpi) to 600 dpi. Although manufacturers claim that higher resolutions can be achieved with software interpolation, such interpolation tends to boost the file size rather than the image quality. Also, most users will be best served by scanning at a resolution that matches their specific needs. For example, desktop printers rarely require more than 300 dpi of data, and images for the Web need to be only 72 dpi.

All but one of the scanners in this roundup use trilinear CCD (charge-coupled device) sensors; CCDs are based on

## INSIDE

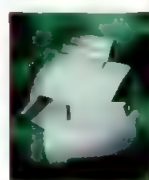
### SHAPING THE CHARTS:

Version 5 of Visio Professional and Standard enable you to produce excellent charts and diagrams. See page 62.



### PRINT VALUE:

NEC's SuperScript 150C and 750C bring affordable,



quality printing to your home. See page 66.

### THEATRIGS:

Macromedia Director 6 is still the standard for multimedia authoring. See page 68.



### MORE THAN PICTURES:

Nikon's Coolpix 300 not only captures stills, but it also records audio, and



allows you to overlay handwritten annotations onto your pictures. For the story, see page 73.

### More Products Reviewed...

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| WinDownload.....         | 58 |
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| Slides & Sound Plus..... | 76 |



# First Looks

digital optical technology. The Artec AS6E is the first color flatbed scanner to incorporate the CIS (Compact Image Sensor), a new semiconductor-based technology that allows additional functions to be integrated onto the chip itself; nevertheless, there are resolution limitations to CIS when compared with CCD technology. The advantage to using CIS is that scanners can be built smaller, with fewer moving parts. Therefore, CIS-based scanners are less expensive.

## HOW WE TESTED

To evaluate the performance of these seven units, we scanned a page of text at 300 dpi and a color photograph of crayons at both 75 dpi and 300 dpi. To gauge the out-of-box experience of using these consumer and SOHO scanners, all testing was done using each vendor's default scanner settings, Twain interface, and bundled software.

The text page contained both Arial and Times Roman fonts. The resulting scanned image was converted to text using the optical character recognition (OCR) software bundled with the scanner; the OCR text was viewed in Microsoft Word and examined for accuracy.

To test color quality, we scanned an 8- by 10-inch glossy photograph of crayons. The photo was first scanned at 75 dpi

and then at 300 dpi. The scanned images were subjectively examined for color fidelity and saturation, shadow and highlight detail, and sharpness.

We also measured how long it took to scan and save the color photograph at 300 dpi. The figures we report for three scanners—the Agfa, Artec, and Info Peripherals—include the times required to both scan and save



### Agfa SnapScan 600

Street price: \$400  
Agfa Division, Bayer Corp.,  
Wilmington, MA;  
800-685-4271,  
508-658-5600  
[www.agfahome.com](http://www.agfahome.com)  
Circle 410 on reader service card.

So if price is your bottom line, then you should turn to our honorable mention, Fidelity Imaging Solutions' Gallery 4800.

If you've never scanned before, now is the time to start.

Agfa Division, Bayer Corp.

### Agfa SnapScan 600

The Agfa SnapScan 600 (\$400 street) is designed for home and SOHO users as well as busy office environments. The SnapScan 600 is the most expensive product in our roundup, so we expected it to outperform the competition. Instead, its results were squarely in the middle of the pack in terms of both speed and scan quality. The scanner's slow speed is particularly sur-

prising, considering that it has a SCSI interface.

The SnapScan is bigger and heavier than many compact scanners featured in this roundup. Still, the unit is the only scanner here with an on/off switch and an optional automatic document feeder. It also has an assembly lock, which allows you to move the unit around safely.

The SnapScan ships with two proprietary Twain interfaces: FotoSnap—an easy-to-use driver—and FotoLook, which has all of the prescan controls, bells, and whistles that graphics professionals need (including the ability to scan in CMYK mode through an RGB-to-CMYK conversion). Also bundled is a light version of Visioneer's PaperPort software.

Hardware installation is a snap, since the included self-terminated Adaptec 1502AP 16-bit SCSI board is a plug-and-play device. At the rear of the scanner, you'll find both a 25-pin SCSI port and a 50-pin Centronics SCSI port for Macintosh and PC compatibility. The scanner's rated optical resolution is 600 dpi, and its scanned measures 8.5 by 14 inches.

In addition to the drivers, Agfa provides a strong selection of software on a single CD-ROM: Caere OmniPage LE, Ulead iPhotoExpress 4.0, and Adobe Acrobat 2.1 (which reads the

the image, as the Twain scan interface saved the image after completing the scan.

## IT'S A TRADEOFF

Every manufacturer here bundles at least image-editing and OCR software with its scanner. Of the units we tested, all but one—the Agfa SnapScan 600—lack a physical on/off switch. All but two have parallel interfaces with pass-through ports for connecting other parallel devices; the Info Peripherals ImageReader has a proprietary add-in board, and the

## Samplings

Using the vendors' default settings and the same 8- by 10-inch photograph of crayons as we did in our last flatbed scanner roundup ("Capture the Color," March 25, 1997) and this issue's color sheet-fed scanner roundup ("SOHO Scanners"), we scanned these images at 75 dpi. The Gallery 4800 and the ViviScan scanned at 100 dpi because of the limitations of their Twain interfaces.



AGFA SNAPSCAN 600



ARTEC VIEWSTATION AS6E



GALLERY 4800



unit's electronic documentation). Because each program or driver must be installed individually (there's no provision for batch installation), installation can be confusing, even if you read the "getting started" manual first.

The SnapScan 600 had a noticeably fast preview scan time, as compared with the other scanners in this roundup. It scanned a letter-size original in nine seconds (using either of Agfa's interfaces). The actual scan time itself, however, was somewhat slow. The SnapScan 600 came in fourth out of seven scanners on our color and monochrome speed tests. This sluggish performance is not what we'd have expected from a SCSI scanner.

The SnapScan didn't distinguish itself with respect to photo quality, either. When scanning at 300 dpi, the device made more mistakes on our OCR test than we could count. It was only when we switched from Foto-Snap to FotoLook at 600 dpi that we were able to get an acceptable OCR scan (with just nine mistakes). Our color image was correctly exposed, but the highlights were clipped and there was a slightly reddish cast to the image.

At \$400, the SnapScan 600 is most appealing for businesses that require good software and a reliable scanner capable of handling large volumes of work. But for the casual user, the Agfa unit is overpriced.

## Editors' Choice

### • Visioneer PaperPort 6000



*If you want the versatility afforded by a 30-bit color flatbed scanner, you no longer have to spend a fortune in order to get a suitable scanner for home or small-office use.*

Of the seven flatbed scanners in our roundup, our Editors' Choice—the Visioneer PaperPort 6000—proved to be an all-around package. At \$299 (list), the Visioneer was neither the least nor the most expensive. Likewise, the unit was neither the fastest nor the slowest of the scanners we tested.

Instead, the Visioneer excels with respect to ease of use and software integration. The lightweight, parallel-port scanner has a painless installation process. This is important, considering the consumer and SOHO audiences slated for this product. The optics have a rated resolution of 600 dpi, and they can produce excellent output without forcing you to adjust the default settings. The scanner uses Visioneer's powerful PaperPort 5.1 software as the Twain interface: once images are

scanned into PaperPort, you can organize the images' thumbnail views and file them away into category-specific folders. On the whole, the Visioneer manages to strike the balance between both worlds, coupling high image quality with a solid software bundle that includes Xerox TextBridge LE, Quicken ExpensAble, Connectix QuickCards LE, and PictureWorks' PhotoEnhancer.

If price is your bottom line, then consider our Honorable Mention: Fidelity Imaging Solutions' Gallery 4800. At \$120 (street), this scanner is about half the price of the Visioneer. But be prepared to make some trade-offs. Even though the 300-dpi Gallery 4800 has great output, an excellent software bundle, and an easy installation process, the scanner's sluggish speed can be a real drawback, especially if you intend on using it often.

Artec/Ultime International

### Artec ViewStation AS6E

At first glance, the Artec ViewStation AS6E (\$120 street) doesn't look like a traditional scanner. It has a slimline, small footprint form factor. The optics move via a steel cable rather than a rubber belt, and there's practically no bezel around the glass surface.

The unit has a 300-dpi optical resolution and an 8.5- by 11.7-inch scanbed. The AS6E incorporates the new CIS chip rather than a CCD sensor. Performance results for this unit were commendable: It was third best in producing color scans and the fastest in monochrome scans—and that scan time includes saving the image.

Setup and installation was a

breeze. Artec's proprietary icon-based interface may be used either as a Twain driver or as a standalone scanner interface. Unlike most entry-level drivers, the AS6E has a number of professional tools and indices, such as gamma, hue, saturation, brightness, sliders for blur to sharpness, and several types of descreening.

Although there's no built-in



IMAGEREADER ISA



OPTICPRO 9630PI



PAPERPORT 6000



VIVISCAN COMPACT II



# First Looks

scaling, the Artec's interface is the only one in this roundup that lets you input the specific dimensions of the original, thus allowing the scanner to scan only the area required by the image. Also, all prescan parameter changes are displayed on the thumbnail immediately, so you can gauge their effectiveness before making the final scan.

The scanner calibrates immediately upon start-up. The Twain interface can save scanned images directly to many file formats. After you've completed your scan, you can click on an application icon to load the image into that application automatically. You can also send images by fax or e-mail, or you can output directly to a printer.

The Artec ViewStation is a relatively quiet machine, producing none of the percolating bump-and-grind sounds often associated with color flatbeds. Unfortunately, our output results were mixed. Color scans were dark and muddy-looking. Also, highlights were clipped, shadows were obscured, and brights were depressed.

The Artec ViewStation is bundled with PhotoDeluxe 2.0 and Xerox TextBridge Classic. The unit is very affordable and scans comparatively quickly, but its scanning quality could be better.

## Info Peripherals ImageReader ISA

Info Peripherals' ImageReader ISA is the first 30-bit color flatbed scanner to hit the \$100 (street) threshold. The low price doesn't mean you're getting a stripped-down unit, however. Rather, the ImageReader is a well-designed scanner with good software, reasonably fast

scanning times, and one of the best interfaces we've seen. Unfortunately, the unit failed to deliver crisp, accurate colors and good shadow details.

The ImageReader gets its speed boost from a proprietary ISA interface board, which transfers data at somewhere between parallel and SCSI speeds. Installing the board was hassle-free.

Although it is not plug-and-play, the board does not use any IRQs or DMAs; it should install easily on most PCs. The board does have three jumpers for setting hardware addresses, and inexperienced users may have a bit of difficulty troubleshooting and resolving conflicts (especially when we installed this scanner under Windows 3.x).

The scanner is continuously powered via the interface board. It has a mini-lever on the bottom for locking and unlocking the carriage. The scanned measures 8.5 by 12 inches.

The spiffy-looking, icon-based interface is instantly comprehensible, even to neophytes. Once an image gets scanned, another screen appears with scanned thumbnails. You can then choose to

save the file, send it to a printer, fax or e-mail it, or drag and drop it directly into an application (links are generated upon installation). The scanner ships with Ulead Morphing and Ulead, Corex CardScan SE, InSight Archiving and Retrieval, Image Pals 2.0 GO!, and Caere OmniPage LE.

Scanning large files with the scanner's Twain interface could pose a problem. Our 18.4MB test photo scanned correctly. Still, we did receive a warning that some operations might not be possible because of the large file size. We were advised to save the image as a file before scanning it. The only option we were given was to save it as a .BMP file (by contrast, smaller files can be saved in a variety of formats).

With a rated resolution of 300 dpi, the scanner produced images that exhibited minor artifacting. Our test-photo scan came in several stops too dark, losing much detail in the shadows. The image also had a red-and-blue cast. Our test OCR document came out with nine

mistakes, which was the second-highest number in our roundup.

Although the ImageReader ISA's scanning quality isn't the greatest, it's good enough for many purposes. It will appeal to those users who are looking for a low price and ease of use.

*Fidelity Imaging Solutions,  
a division of Mustek Inc.*

## Gallery 4800

The Fidelity Gallery 4800 (\$120 street) is an easy-to-use scanner capable of producing good quality scans. The caveat here is the unit's discouraging, slow-as-molasses scan times.

Manufactured by Fidelity, a subsidiary of Taiwanese scanner-maker Mustek, the Gallery 4800 has the same CCD, optics, and 300-dpi optical resolution as the more expensive Mustek EP Plus III. The difference lies in the construction: The Gallery 4800 is smaller and lighter, and it has fewer moving parts. Although there is no scanner lock, the scanner automatically tightens a steel cord when the power is off, making it safe to move the device. The scanned is 8.5 by 11.7 inches.

Installing this scanner was easy. The icon-based Twain driver offers a clean and simple interface, but only a handful of prescan tools. You are limited to specifying the scanning resolution in increments of 50 dpi,

which will prove frustrating if you plan on scanning images for use on the Web. For scanner neophytes, Fidelity provides a useful Acrobat file

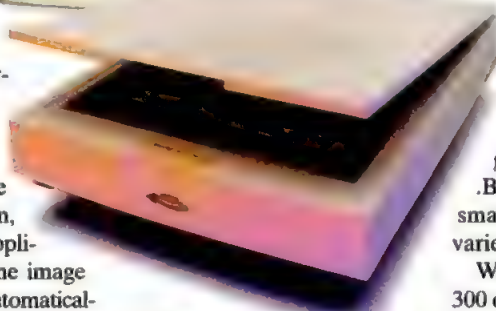
with scanning tips that guide users through the scanner's functions.

The biggest drawback to the Gallery 4800 is the abysmal scan speed. Each scan is preceded by a lengthy warm-up and scanner calibration. You can skip this step, thereby reducing scan time from 52 to 20 seconds. Still, Fidelity admits that it deliberately sacrificed speed for image quality, and the vendor strongly recommends you use this step.

On testing, the Gallery 4800's results were a mixed bag. There were only five minor mistakes on the OCR test. The colors

### Artec ViewStation AS6E

Street price: \$120  
Artec/Ultima International,  
Freemont, CA;  
510-440-1200,  
fax: 510-440-1216  
[www.artecusa.com](http://www.artecusa.com)  
Circle 409 on reader  
service card.



### ImageReader ISA

Street price: \$100  
Info Peripherals,  
Campbell, CA;  
800-777-3208,  
408-538-2500  
[www.infoconnection.com](http://www.infoconnection.com)  
Circle 412 on reader  
service card.







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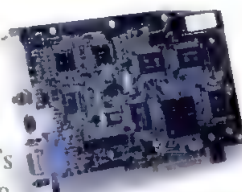
## Gateway E-Series Workstations

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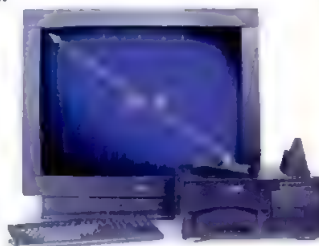
## Accelerated Graphics Port (AGP)

Creating amazing graphics on your PC screen used to take a lot of memory on your graphics accelerator card. AGP, the next-generation graphics system developed by Intel, transfers some video memory functions to the system's memory. That lets your video card widen the flow of data to the monitor, creating smooth, fast video and sophisticated 3-D performance. It's like adding four lanes to your video data highway for the price it takes to paint the center line.



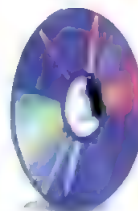
## Destination™ Digital Media Computer

In April 1996, the Gateway Destination Big Screen PC/TV pioneered the PC category that merges television and computer technology. Now the bright light in the convergence category gets brighter with the second-generation Destination Digital Media Computer. The system comes with an even bigger screen — an enormous 36-inch monitor (35.5-inch viewable). The pristine digital picture of DVD on a huge digital monitor: Video nirvana.



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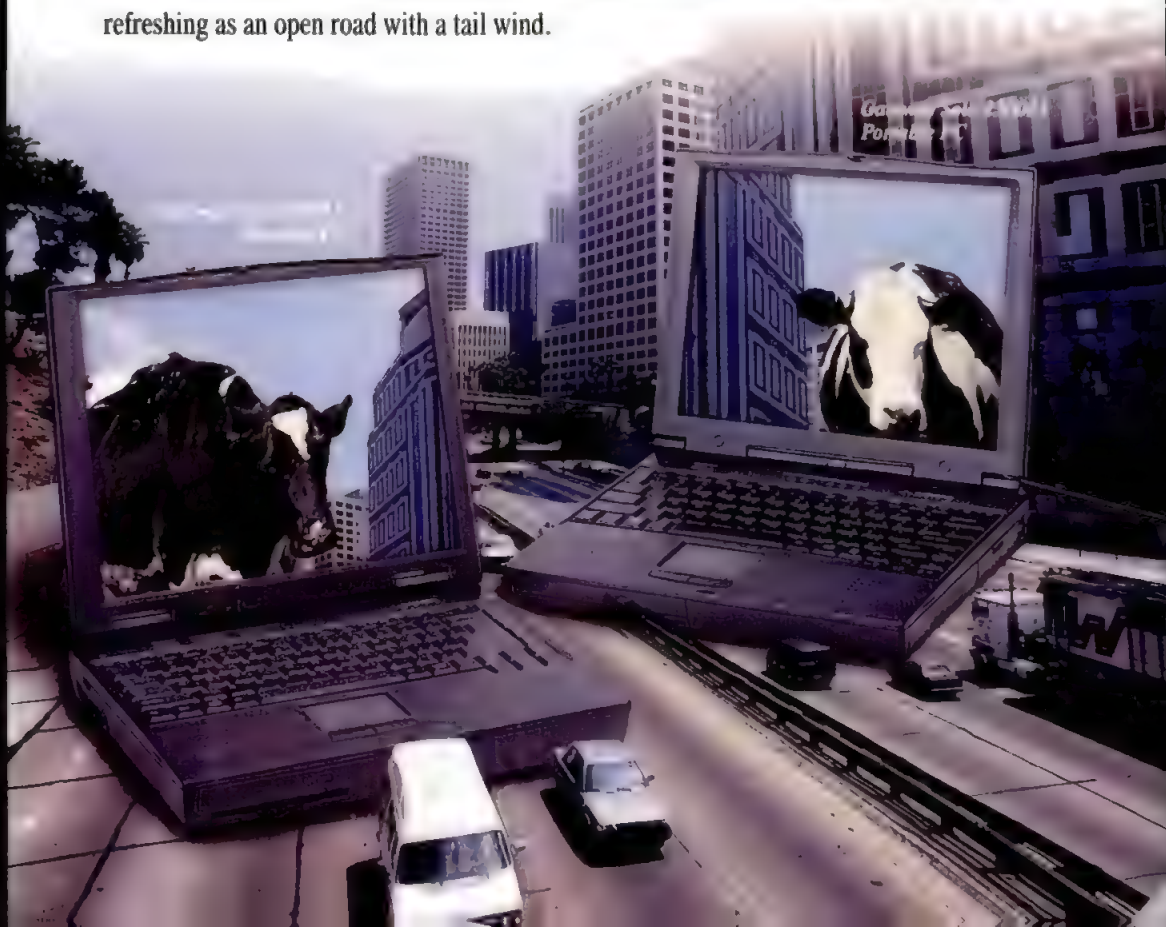
Our flagship Gateway Solo 9100 portable was built with one word in mind: features. The result is a portable that can take care of business as well as your desktop system and still come along on road trips. Common docking stations for all our Gateway Solo portable PCs let you turn any portable into a desktop.

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- Gateway Solo Mini Docking Station
- MS Windows 95 & MS Office 97, Small Business Edition plus Encarta 97
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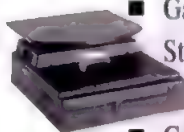
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*Gateway Destination D6-300XL  
Digital Media Computer with  
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- Ensoniq® Wavetable Audio
- ▶ Boston Acoustics® MicroMedia™ Speakers
- TelePath® Modem for Windows with x2™ Technology\*\*
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- Cordless Keyboard w/ Integrated EZ Pad® Pointing Device
- Cordless Field Mouse® Remote
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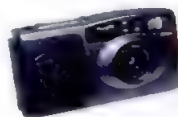
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- 3.5" Diskette Drive
- Ensoniq Wavetable Audio
- ▶ harman/kardon® High-Fidelity Sound System
- TelePath Modem for Windows with x2 Technology\*\*
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\*The Destination 31-inch and 36-inch monitors are covered by a one-year limited warranty. Call or write for a free copy.

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Destination Big Screen PC/TVs For Group Computing



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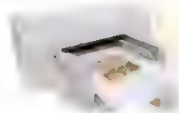
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- ▶ nVidia 4MB 3-D AGP Graphics
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- 4GB 11ms Ultra ATA Hard Drive
- 12X min/24X max CD-ROM & 3.5" Diskette Drives
- Ensoniq® Wavetable Audio
- ▶ Boston Acoustics® MicroMedia™ 3-Piece Speaker System
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- ▶ nVidia 4MB 3-D AGP Graphics
- 8.4GB 8.5ms Ultra ATA Hard Drive
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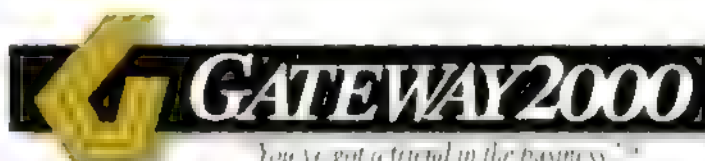
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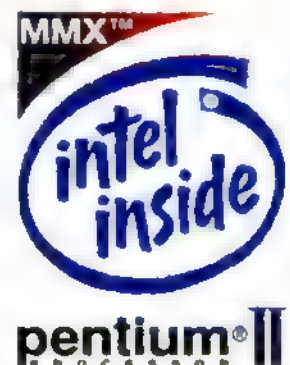
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# First Looks

(particularly the whites) were clear and accurate, and they showed good saturation. There is good detail in the shadows, although the overall image is a little on the dark side.

The Fidelity Gallery 4800 has an outstanding collection of software, including Xerox TextBridge Classic OCR, Ulead's iPhotoPlus, and two versions of Micrografx's professional image-editing program: Picture Publisher 5.0 for Windows 3.x and Picture Publisher 6.0 for Windows 95.

The price of the Gallery 4800 is good, the software is great, and image quality is satisfactory. But if speed is important, then this isn't the device for you.

Plustek Inc.

## OpticPro 9630PL

At \$250 (street), Plustek's OpticPro 9630PL flatbed scanner is one of the more expensive 30-bit scanners in this roundup. It handles a greater volume of scans and incorporates many higher-end features, such as a long-life, cold-cathode tube instead of a fluorescent bulb.

The OpticPro is a relatively fast scanner, logging the best

score for color scans and the second best score for monochrome scans. The scanner had the fewest mistakes on our OCR test, merely mistaking a capital "F" for a lowercase one.

Although the scanbed is 8.5 by 14 inches, the scanner itself has a long, trim appearance. The rated optical resolution is 600 dpi.

Hardware and software installation is a no-brainer—all software installs automatically in one shot. Scanning can be somewhat daunting if you

icons or pulldown menus control which functions.

Once an image is scanned, it



**OpticPro 9630PL**  
Street price: \$250  
Plustek Inc.  
Sunnyvale, CA;  
800-685-8088,  
408-453-5600  
[www.plustekusa.com](http://www.plustekusa.com)  
Circle 413 on reader service card.

illustrated documentation. It is definitely a comparatively fast scanner, but its scanning interface does need some refinement.

Visioneer Inc.

## PaperPort 6000



Already known for its sheet-fed scanners and PaperPort software, Visioneer enters the flatbed scanner market with the Visioneer PaperPort 6000 (\$299 list), our Editors' Choice in this roundup. The major distinguishing factor of the PaperPort scanner is Visioneer's software bundle, specifically Visioneer PaperPort 5.1.

As a Twain-compliant and standalone driver, PaperPort 5.1 stands out from the rest of the scanners in our roundup with its easy-to-use, intuitive, and elegant drag-and-drop interface. PaperPort 5.1 has excellent links for taking a

takes just a single mouse click to fax it, e-mail it, or print it. The OpticPro comes bundled with Micrografx's Picture Publisher 6.0 for Windows 95, Expedition TypeReader OCR software, and Plustek Action Manager, a document-filing program that facilitates easier image storage and retrieval.

The Plustek OpticPro did reasonably well on our color tests. The color image exhibited decent saturation and vibrant colors, but it looked somewhat dark to us. In addition, we noticed impure whites and a loss of detail in the shadows.

Plustek pieces together a truly comprehensive package for consumers, with an illustrated list of what's included in the box and well-written and il-

don't want much more than a point-and-shoot interface. The Twain interface, while not industrial strength, comes with a number of prescan tools, including gamma, tone map, and a histogram. It is not obvious, though, which

## PERFORMANCE TESTS

### 30-Bit Color Flatbed Scanners



Our test-bed was a Micron Millennia with a Pentium MMX/200 CPU, running Windows 95. We scanned a PC using each vendor's default settings and timed how long each product took to complete a monochrome and a color scan at 300 dpi. Three of the scanners—the Agfa, Artec, and Info Peripherals—automatically saved the image on completing the scan. The remaining four scanners scanned and saved in two separate steps; for these units we report scan times only.

Bold type denotes first place

|                                                | Monochrome Scan<br>Minutes:seconds | Color Scan<br>Minutes:seconds |
|------------------------------------------------|------------------------------------|-------------------------------|
| Agfa SnapScan 600 (SCSI)                       | 1:18*                              | 2:17*                         |
| Artec ViewStation AS6E (parallel)              | 0:17*                              | 2:10*                         |
| Info Peripherals ImageReader ISA (proprietary) | 1:01*                              | 1:04*                         |
| Fidelity Gallery 4800 (parallel)               | 0:33                               | 5:29                          |
| Plustek OpticPro 9630PL (parallel)             | 1:10                               | 1:35                          |
| Visioneer PaperPort 6000 (parallel)            | 0:15                               | 2:36                          |
| Vivitar ViviScan Compact II (parallel)         | 1:34                               | 4:58                          |

◀ BETTER

◀ BETTER

\* This product scans using the Twain interface, which automatically saves the file after the scan is completed. The time shown is for this combined process.



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# First Looks

## HP ScanJet 6100Cse: One Notch Up?

**W**e didn't include Hewlett-Packard's ScanJet 6100Cse in our main roundup because, at \$800 (street), it doesn't qualify as an entry-level product. What's more, it's targeted primarily at businesses, not family and SOHO users.

Given the higher price point, it's natural to expect that the ScanJet would easily outperform and outscore all the units in our entry-level roundup. Surprisingly, though, it didn't.

The ScanJet beat all the scanners hands down on our color scanning speed test, but five models had faster monochrome scan speed than the ScanJet. It also posted the second-highest OCR mistake count, with 16 errors. What's more, we had to bump the resolution up to 600 dpi to get the mistake count down to 16. The ScanJet did moderately well on our color test scan, with good details in highlights and shadows. On the other hand, the colors were too bright and slightly unrealistic.

The ScanJet has a rated resolution of 600 dpi. It is larger and heavier than the typical entry-level scanner,



and it has an 8.5- by 14-inch scanbed. Even though the included Adaptec SCSI-2 board is not a plug-and-play device, setup proceeded without a hitch. There's both a built-in carriage lock and an on/off switch. HP includes a triangular mirrored device for scanning 35-mm slides without an auxiliary light source; a transparency adapter is optional.

HP's scanner interface is utilitarian and somewhat intimidating, with numerous pulldown menus, slider controls, curves, and a cube-shape box for adjusting continuous color tones. Unless you read through the excellent but lengthy online documentation, navigating through this nomenclature-littered interface can be difficult.

Nevertheless, the ScanJet excels over entry-level scanners in productivity. Designed to do heavy-duty work in professional environments, the HP's reliability and consistency are its greatest assets.—*DG & SWG*  
**HP ScanJet 6100Cse.** Street price: \$800. Hewlett-Packard Co., Palo Alto, CA: 800-722-6538, 415-857-1501; [www.hp.com/go/scanjet](http://www.hp.com/go/scanjet).



scanned image and automatically launching any number of applications or actions.

The first thing you see when you open PaperPort 5.1 is Scan Manager, which prompts you to establish the nature of the original you'll be scanning. There are preset options for color photos, black-and-white photos, OCR text, and faxing, filing, and copying. There's also a custom setting that allows you to adjust your own resolution parameters. Slider controls make it easy to alter the brightness and contrast of your scan, and the advanced settings let you change the resolution and gamma. Once it is

scanned, the image gets displayed as a thumbnail in the PaperPort desktop.

The PaperPort 6000's software bundle includes Xerox TextBridge LE, Visioneer Web Publishing Kit, Corex CardScan SE, PictureWorks PhotoEnhancer, Intuit Quick-Enter ExpensAble, and Connectix QuickCards LE. Installation and setup

of the software is effortless.

The compact PaperPort 6000 scanner has a cover that's conveniently hinged on the

side instead of the back. The legal-size scanbed accommodates 8.5- by 11.7-inch originals. A built-in locking mechanism protects the PaperPort during moving. The scanner has a rated optical resolution of 600 dpi.

The exceptional software bundle is somewhat tempered by the scanner's mixed performance results. The PaperPort 6000 clocked the second-best speed for monochrome scanning, but four scanners posted faster times on our color scan test. Our OCR test produced eight errors. The quality of the scanned color image was good; even though it lacked vibrant colors, the image showed good detail in the shadows.

A superior software bundle makes the Visioneer PaperPort 6000 a winner in this roundup. Nevertheless, for it to be considered an all-around champion, we would like to see some improvement in speed.

Vivitar Corp.

### Vivitar ViviScan Compact II

Another newcomer to the scanner market is Vivitar, a company known for its affordable cameras and recently released CMOS digital camera. The vendor enters this market with the \$190 (street) ViviScan Compact II.

Like the majority of the scanners in our roundup, the ViviScan Compact II is a parallel-port scanner. The device is compact and lightweight enough to be a stylish desktop companion to your PC. Its scanbed measures 8.5 by 11.7 inches, and its optical resolution is 300 dpi.

The scanner's cover snaps off, allowing you to scan thick originals. There is no lock mechanism, although it does lock automatically when the power is off.

Hardware installation and setup were accomplished quickly. Installing the software

### PaperPort 6000

List price: \$299  
Visioneer Inc.,  
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800-787-7007,  
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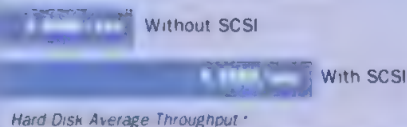
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\*For information by fax, dial 1-408-957-1150. Request document no. 11460. \*SCSI drive: Western Digital WDE-170 with Adaptec AHA-2940UW SCSI card. IDE drive: Seagate ST-52520A. Dell Pentium Pro 200 PC. 32MB RAM. Intel chip set B2a. 150 FC bus master IDE interface. Windows NT Workstation 4.0. AT graphics accelerator Mac II 64. Adaptec ThunderLink™ (trade name). ©1997 Adaptec, Inc. All rights reserved. Adaptec, ThunderLink, AHA, the Adaptec logo and tag line are trademarks of Adaptec, Inc., and may be registered in some jurisdictions. Windows NT is a trademark of Microsoft Corporation, used under license. All other trademarks belong to their respective owners. Always drive responsibly.







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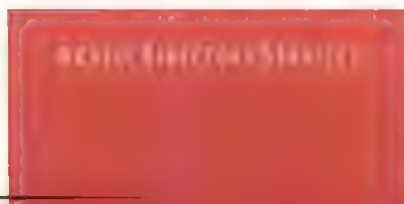
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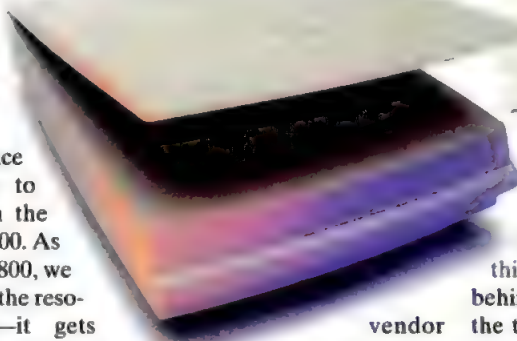
# First Looks

required us to first run a floppy setup disk and then insert the enclosed CD-ROM disk when prompted. As soon as we installed the Twain driver, we noted how the fluorescent lamps and green ready light on the scanner became activated.

The scan interface itself is identical to that shipped with the Fidelity Gallery 4800. As with the Gallery 4800, we were unable to set the resolution manually—it gets changed by a slider control in 50-dpi increments.

Another attribute that the Compact II shares with the

Gallery 4800 is incredibly slow scanning times. Each scan is preceded by a regular warm-up and calibration period. The



vendor warns you not to bypass the scanner warm-up, but you would not notice any real improvement in speed

## ViviScan Compact II

Street price: \$190  
Vivitar Corporation,  
Newbury Park, CA;  
800-682-6577,  
805-498-7008  
[www.vivitarcorp.com](http://www.vivitarcorp.com)

Circle 415 on reader service card.

even if you were to skip the warm-up period. The Compact II logged the second-slowest scan times out of all the units in this roundup, and it lagged behind every other scanner in the time it took to save files. The scanner also failed miserably on our OCR test, with no fewer than 80 mistakes (which was the most out of all the

scanners that we tested in this roundup).

On the bright side, the Compact II's performance excelled on our color test. The image's colors were bright, realistic, and well-saturated. Even better was the pure coloring of the white crayon. There were discernable details in both shadows and highlights, and the image's quality was both clean and crisp.

Vivitar bundles the Compact II with Xerox TextBridge OCR software and Ulead's iPhoto Plus image-editing package. The Vivitar Vivicompact II is a slow-but-steady performer that is capable of producing some excellent color photo scans. **PC**

## WINDOWS UTILITIES

# Two Shareware Gems

*Flywheel and WinDownload provide inexpensive yet elegant solutions to user problems.*—By Barry Simon

Since the dawn of personal computing, shareware products have filled specialized niches. Two recent releases exemplify this phenomenon. Flywheel gives owners of the Microsoft IntelliMouse the ability to use the built-in wheel in legacy applications that don't support it. WinDownload is an essential tool for those who download a lot of programs from the Internet, whether via a browser or by direct FTP.

## FLYWHEEL

Plannet Crafters' Flywheel is a \$10 shareware product available for download at the company's Web site or at ZDNet ([www.hotfiles.com](http://www.hotfiles.com)). Once installed, it loads each time you start Microsoft Windows 95. You control its options via a tab that it adds to the mouse applet (which is available from the control panel or from the mouse icon that the IntelliMouse software places in the system tray). When Flywheel is running, the wheel

works in any application—even with DOS windows that have a scroll bar.

The program adds two other features that enhance applications that already have IntelliMouse support. With Flywheel running, you can cycle through open windows in an MDI application (Microsoft Excel, for example) that supports the next window command. In addition, the program allows you to choose between scrolling screen by screen or a few lines at a time.

## WINDOWNLOAD

The \$20 shareware WinDownload is essential for anyone who downloads often over the Internet. This program lets you schedule downloads for any time you choose. For example, you can set it to download only at night, when lines aren't likely to be as busy.

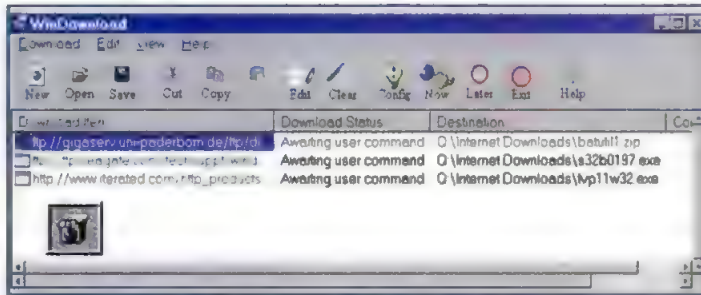
You load WinDownload be-

fore starting up your browser. Besides the main program window, a small drop target is added, which you place next to your browser. While browsing, if you come to a link that would start a download, you simply drag and drop the link to the WinDownload target.

WinDownload handles both HTTP file commands and FTP, and it can download several

tests. This caused difficulties with some popular shareware libraries, but for driver downloads and files from sites with less structured organization, the program was a pleasure to use and a great help.

**Flywheel, Version 1.01b.** \$10 shareware. Requires: Microsoft IntelliMouse, Microsoft Windows 95, NT 3.51, or 4.0. Plannet Crafters, Alpharetta, GA; 770-



**DOWNLOAD MANAGER:** WinDownload's elegantly simple interface shows you the status of all the downloads you have queued.

files simultaneously (which is efficient when dealing with busy servers). If it can determine a file's size, the program shows a progress bar and an estimated time of completion.

Download links that don't make a simple file request but instead send a complex script to a server via an HTTP command line didn't always work on our

667-1278, fax: 770-752-5416; [www.plannetarium.com](http://www.plannetarium.com). Circle 407 on reader service card.

**WinDownload, Version 3.4.** \$20 shareware. Requires: Microsoft Windows 95 or NT, Internet connection (including dial-up). Rick McClanahan, Centerville, VA; [mason.gmu.edu/~rmcclana](mailto:mason.gmu.edu/~rmcclana). Circle 408 on reader service card.

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Tim said, “100% Pure Java<sup>TM</sup> programs give us the latest data from our intranet. So we can all work faster. We can have our products in the stores sooner.”

“And we can kick our rivals in the bottom!” said the boss.

Tim and the boss laughed.  
“Ha, Ha, Ha!”

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to·tal da·ta shar·ing

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# First Looks

## BUSINESS GRAPHICS SOFTWARE

### Charts for Nonartists

*Visio Version 5 provides great charting tools for the artistically challenged.—By David Haskin*

A chart may save you a thousand words of explanation in a memo or report, but if you can't draw a straight line you need a program like Visio 5. Visio is a pioneer of business graphics programs that help nonartists create professional-looking charts, and Version 5 adds polish, flexibility, and power to the genre.

Visio comes in three flavors. The Standard edition (\$150 street price) helps you create basic business graphics such as flow and organizational charts, and it serves as the platform for the other two editions. Along with basic charts, Visio Professional (\$350 street) creates diagrams of information systems as well as software-development projects. Visio Technical (\$350 street) creates two-dimensional technical drawings. We took a look at Visio Standard and Professional for this review.

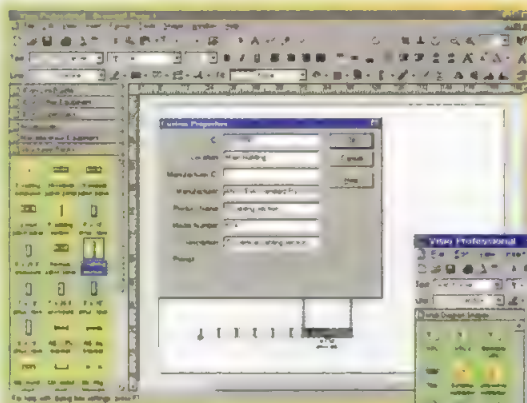
#### IMPROVING ON THE STANDARD

As in previous versions of Visio Standard, you create drawings by dragging shapes from palettes to the work area—Version 5 comes with about 1,300 shapes. When appropriate, you use smart lines to connect shapes (such as when you connect a manager to subordinates in an organization chart). You can connect groups of shapes by highlighting them all and then clicking a button on the toolbar.

One reason why these lines

are so smart is that they stay connected even if you move the shape. Visio has added even more intelligence to the lines in this upgrade. The connectors automatically reroute themselves so that existing lines don't overlap the new shapes you add to the drawing. This ensures that charts remain easy to read as you add to them.

Visio's interface closely re-



**SHAPE UP:** Visio Professional comes with shapes for specific brands and models of network equipment. Attached to each of these shapes is database information.

sembles that of Microsoft Office 97. You format charts by making selections from the toolbar; for instance, you can select fonts, line weights or shadows, and fills from the toolbar. Like a word processor, Visio includes precreated formatting styles for shapes, lines, and text that you select from a drop-down list; you can also create your own styles.

Both Visio versions are now more adept at creating specific types of general business charts. For instance, new columns are available in Gantt charts for data, such as the percentage of a project that's already completed. These columns and the related timeline bars are linked—

change the data in the column and the bar changes accordingly. Conversely, if you drag the end of the timeline bar to make it longer or shorter, the data in the column changes. In addition, you can now exchange timeline-related information with Microsoft Project. Visio has also beefed up its marketing charts, adding 75 new shapes for pyramid and bubble charts.

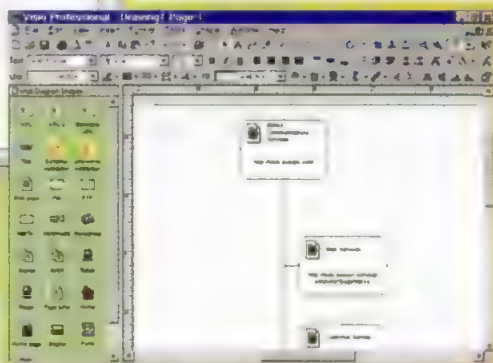
Visio acts as a graphical database if you attach database attributes to shapes in the drawing. This means you could create a room-layout diagram and affix a product name and

cost to each piece of furniture. You can then use a wizard either to create an on-screen report or to export the data for use with specific tables created by other data-

base programs. The on-screen report for the room-layout diagram might include the amount of furniture and its total cost. In this upgrade, Visio has focused on keeping its interface and technical underpinnings up to date. During installation, Visio can add toolbar buttons to Microsoft Office 97 applications for creating OLE-embedded charts directly within those programs (the program could already do this with Office 95).

Visio is currently ODMA-compliant, which means you can use Web-based and LAN document-management systems for tracking revisions and checking Visio drawings in and out. Also new in this version of Visio Standard is the ability to create macros and customize applications with the included Visual Basic for Applications.

Other improvements make Visio more Web-savvy. You can now create links within Visio charts that connect to Web resources. When you save charts in HTML format and view them using your browser, the links you created while developing the chart remain live. As you'd expect in a program aimed at a general audience, Visio Standard also has tools that simplify and automate various tasks. It includes 15 wizards for such simple tasks as creating basic charts and for more complex chores, such as exporting database information to other applications.



**WEBMASTER:** You can quickly create maps of Web sites using a wizard. After telling the wizard what site you want to map, it examines the site and generates the chart.

#### PROFESSIONAL FEATURES

Visio Professional does everything that the Standard edition can do (in fact, the Standard edition comes with Professional), but it's tuned toward IT professionals and software developers. It has

about 1,000 networking and telecom shapes, including 350 new shapes, many of which are targeted for network products.

These vendor-specific shapes come with precreated fields that already include information such as model names, product descriptions, and part numbers. If you have network information in a database file, a Visio Professional wizard can use it to create charts of your specific network configuration automatically.

Similarly, there's a wizard for

Similarly, there's a wizard for

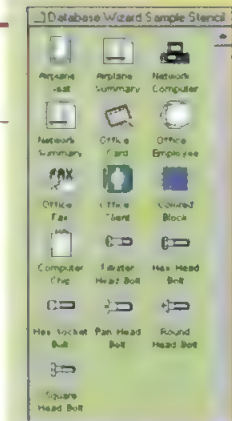
Similarly, there's a wizard for

Similarly, there's a wizard for



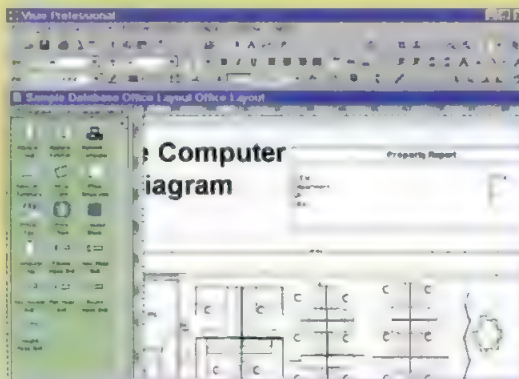
mapping Web sites. You tell the wizard the URL, how many levels you want in the map, and formatting information such as the shape of the chart. The wizard then examines the site and automatically develops the map, which resembles a flow chart.

Visio Professional now includes shapes for the Unified Modeling Language (UML), a language that describes the building of complex software-development projects. Handily, it includes a wizard that checks UML diagrams for errors such as shapes that aren't connected. It describes the errors that it finds, and it then suggests how you should correct them. In addition, you can export UML diagrams to Microsoft Repository, a system for storing data such as UML information.



Besides supporting UML, Visio Professional has other new shapes for software and database diagramming, including Bachman modeling and Object Role Modeling. In addition, it provides Office 97 shapes that include dialog boxes, progress bars, drop-down menus, and critical-error icons.

Visio founded the software



**350 SHAPES:** You can create reports that summarize the database properties you attach to shapes. In this case, this is a simple report on a room-layout diagram.

category that helps nonartists create professional business graphics. With Version 5, it remains the leader in terms of both power and flexibility. The Standard version is the ideal tool for creating basic business

charts that you can add to reports and memos. The Professional version provides tools for developing and managing large projects, networks, and Web sites.

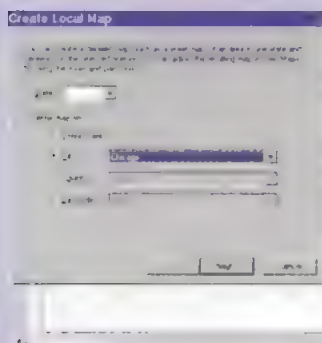
**Visio Version 5.0.** Street price: Visio Standard, \$150; Visio Professional, \$350; Requires: 486 or better processor, 16MB RAM (24MB for Windows NT), 90MB hard disk space for the Standard Edition, 110MB for Professional, Windows 95 or NT 4.0; Visio Corp., Seattle, WA; 800-248-4746, 206-521-4500; [www.visio.com](http://www.visio.com). Circle 405 on reader service card.

## Mapping with Visio

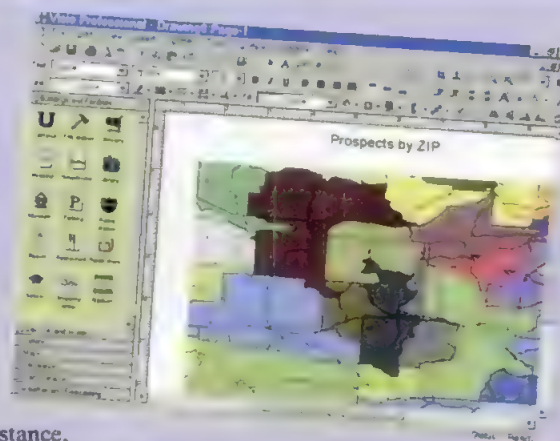
**V**isio makes it simple for nonartists to create professional-looking charts and diagrams. But what if you need geographically accurate maps that display the location of your top sales prospects? As with business graphics, this vendor has a solution: Visio Maps.

Visio Maps (\$200 street) makes it easy to create street-level maps and to insert database information into those maps. When you install Maps, you designate which geographical areas you want to add; the program includes about 1GB of geographical information as well as street, ZIP code, and Census Bureau data.

As with all Visio charts, you begin by dragging a map shape to the work area. A wizard then appears and asks you for the geographical area you want to include as well as the level of detail. For instance, you can include landmarks, ZIP codes, census-tract boundaries, or streets. Clicking on a landmark or street, for instance, displays its name on-screen.



**MAP IT:** You create maps with this wizard, in which you select geographical locations and other information you want to include.



**SELL:** Visio Maps enables you to create maps tied to live data, such as the location of sales prospects.

The program embeds maps into Visio drawings as OLE objects. So when you double-click on the map, the menus and toolbars for the add-in replace Visio's normal menus and toolbars. After embedding the map, you can place regular Visio symbols in that map. For instance, you could add precreated symbols showing hospitals, restaurants, or colleges.

Another wizard is available for adding data to the map from external sources, such as database and spreadsheet files. The wizard walks you through the process of selecting the external data source and then linking fields within it to specific types of information on the map, such as streets. After creating the map and adding data, yet another wizard walks you through the process of formatting the map, determining what information displays on-screen.—DH  
**Visio Maps.** Street price: \$200. System requirements: 486 or better processor, 16MB RAM (24MB for Windows NT), 10MB hard disk space (minimal installation).





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# First Looks

## PRINTERS

### SOHO Ink Jets Shine

*NEC's SuperScript 150C and 750C home and office printers are great values.—By Bruce Brown*

**N**EC Technologies' SuperScript 150C (\$120 street price after \$20 rebate) and SuperScript 750C (\$200 street, after \$30 rebate) are great buys for family and home use. Although both printers are somewhat slower on certain tests compared with competitive models, print quality is roughly comparable and the prices are definitely right. The rebates expire in January 1998, but it's a safe bet that the prices will then fall to match the rebated costs.

Both printers come bundled with media samples and two pieces of software—Sesame Street Art Workshop and Broderbund Software's The Print Shop. The printers are each backed by a one-year warranty with overnight replacement service. Both are HP PCL 3+ printer-language compatible, and the SuperScript 150C also supports IBM ProPrinter emulation.

#### NEC SUPERSCRIPT 150C

The SuperScript 150C comes standard with only a color cartridge. You can purchase a black-ink cartridge for \$25 (street price). All black text or images use process black, which consumes a great deal of ink and generally isn't satisfactory for more than casual documents. Process-black text is not very pleasant to look at, so you should buy a black cartridge if you plan on doing little more than just text work. Maximum rated speeds are 3 pages per minute (ppm) for black and 3 minutes per page for color, both in draft mode.

Graphics are also pretty

grainy in standard mode, although the quality improves markedly in high-quality mode (especially on premium paper). The 150C's driver had a problem with Lotus Freelance, in this case losing font proportions;



**DESK DUTY:** The SuperScript 750C (top) and the SuperScript 150C.

other applications, however, ran without a single hitch.

You can load up to 40 sheets of paper easily on this small printer (14.2 by 14.8 by 7.9 inches, HWD) via the top feeder, which can also handle single note cards, transparencies, and envelopes. There is no output tray.

The 150C was sluggish during speed testing, taking more than 12 minutes to print our five-page Microsoft Word test and almost 20 minutes to print the monochrome and color Excel two-page business charts. For the 150C's target market, however, speed is not as important as its price and print quality.

Black-ink printing is competitive at 4 cents per page with 5 percent coverage, but 15 percent color coverage at 34 cents per page is high. Replacement color cartridges cost \$30 (street price). On the whole, the 150C

remains a good deal for families that are planning on giving it light use only.

#### NEC SUPERSCRIPT 750C

The NEC SuperScript 750C, rated at 6 ppm in black and 2 ppm for color printing, is a big step up in speed and quality from the 150C at not too great an increase in price. The 750C is a 600-dpi, five-color, two-head printer with 1MB RAM. The printer's TrueColor technology uses variable drop-size (VDS) with two blacks—Midnight Black (with large drops for deep color and large black areas) and Graphic Black (with smaller dots for more precision for truer gray scale and better blending with other colors).

The 750C, a medium-size printer at 9.3 by 18.1 by 18.3 inches (HWD), can accommodate 120 sheets or 25 envelopes. It has an optional Photo Cartridge (\$45 street) for

cent black and 37 cents for 15 percent color. You can also replace the ink tanks alone for \$19.95 and \$21.95 (black and color, respectively); the cost drops down to 3 cents per page for black and 20 cents per page for color printing.

With real black for text printing, the 750C does a good job. A little bit of bleed is visible in standard mode on plain paper, but the quality is fine for typical home- and business-printing tasks. Colors and gray scale are pretty good in graphics printing (even in standard mode) and richer in high-quality and presentation modes.

As with the 150C, this printer's driver had a problem with Lotus Freelance (which doesn't follow the Windows 95 standard); in this case, the 750C deleted the test slide's background color. There was some graininess with normal color inks in presentation mode (even on glossy paper), but the grain disappeared when we used the small-dot photo-ink cartridge.

The SuperScript 750C is a good choice for busier families or small-office use. The 750C's better speeds, good black-text quality, improved graphics printing, and potential for photo-quality printing make it a sensational buy at a competitive price.

#### NEC SuperScript 150C.

Street price: \$120 (after \$20 rebate).

Requires: 386 or bet-



**SIDE BY SIDE:** Output from the SuperScript 150C (left) and the SuperScript 750C.

ter PC, 4MB RAM, 7.7MB hard disk space, Microsoft Windows 3.x or Windows 95. use with special photo paper (\$12.95 for 10 sheets), with a combined paper and ink cost of about \$1.75 per full page—a deal that is comparable to photo-finishing costs. When we tested it with photo files, the 750C did a good job, printing smooth, fine details.

Replacement black (\$30 street) and color (\$40 street) print-head cartridges yield per-page costs of 5 cents for 5 per-

cent black and 37 cents for 15 percent color. You can also replace the ink tanks alone for \$19.95 and \$21.95 (black and color, respectively); the cost drops down to 3 cents per page for black and 20 cents per page for color printing.

**NEC SuperScript 750C.** Street price: \$200 (after \$30 rebate). Requires: 386 or better PC, 4MB RAM (8MB recommended), 7.7MB hard disk space, Microsoft Windows 3.x or Windows 95. NEC Technologies Inc., Imaging Division, San Jose, CA; 800-632-4636; [www.nec.com](http://www.nec.com). Circle 401 on reader service card.



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| 8 MB  | 2x32/36 | \$32/\$59   |
| 16 MB | 4x32/36 | \$59/\$64   |
| 32 MB | 8x32/36 | \$135/\$145 |

### 72-pin SODIMM

|       |      |      |
|-------|------|------|
| 4 MB  | 1x32 | \$26 |
| 8 MB  | 2x32 | \$36 |
| 16 MB | 4x32 | \$67 |

### 144-pin SODIMM

|       |      |       |
|-------|------|-------|
| 8 MB  | 1x64 | \$34  |
| 16 MB | 2x64 | \$61  |
| 32 MB | 4x64 | \$221 |

### 168-pin DIMM

|       |         |             |
|-------|---------|-------------|
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# First Looks

## MULTIMEDIA AUTHORING TOOLS

### The Scripting Standard

*Macromedia Director Version 6 remains the measuring stick for multimedia authoring tools.—By Luisa Simone*

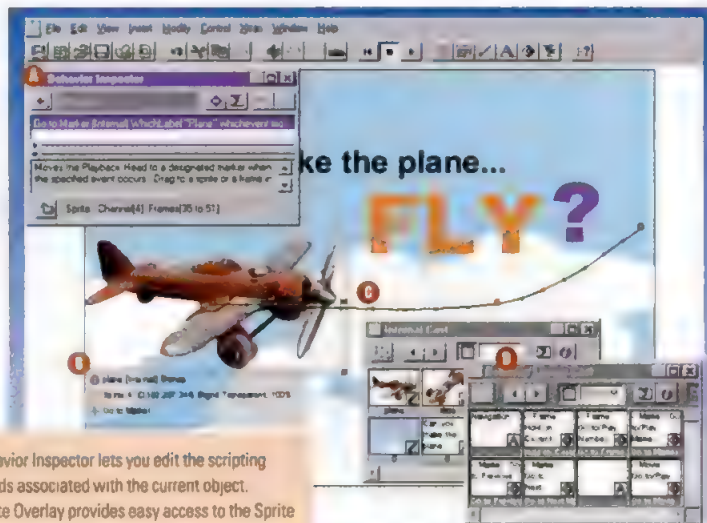
**P**revious versions of Macromedia Director have set the standard for frame-based animation and multimedia authoring on both the Mac and PC platforms. Version 6, which is sold only as part of Director 6 Multimedia Studio (\$1,000 street), doesn't change the program's core functions or theatrical metaphor: You still import text, image, sound, OLE, and video objects into a project as cast members, position them on the stage as sprites, and orchestrate their relationship to one another using the score. But every aspect of this process is now easier, thanks to a revamped interface and a brand new emphasis on object orientation.

Sprites are now treated as true objects, making them directly editable. For example, you can draw and modify an object's animation path on the stage. And a new interface convention—called the Sprite Overlay—now only displays important information about a sprite (such as its name, size, and position) but provides one-click access to Cast Member and Sprite Inspector floating palettes, where you can edit those properties.

Object orientation pays even bigger dividends when the time comes to add interactive behaviors to a movie. Previous versions of Director forced users to use Lingo—a robust scripting language with a steep learning curve. Director 6 supplies over 30 common behaviors, allowing you to add interactive events, actions, and user controls to a movie with virtually no knowledge of Lingo.

These behaviors are object

properties that are assigned to a sprite with a simple drag-and-drop operation. You can build up complex interactions by



- 1 The Behavior Inspector lets you edit the scripting commands associated with the current object.
- 2 The Sprite Overlay provides easy access to the Sprite Inspector and Behavior Inspector floating palettes
- 3 You can interactively draw and reshape a sprite's animation path.
- 4 Cast members and commonly used behaviors are stored in drag-and-drop palettes

dragging several behaviors onto a sprite. In fact, behaviors are just another element in a movie; they appear in the cast-member palette, they're listed in the Sprite Overlay, and they can be modified using the Behavior Inspector floating palette.

During testing, we used predefined behaviors to create a pause on a specific frame, clickable objects associated with go-to commands, and a trigger for soundtrack playback. Ultimately, behaviors are still driven by Lingo. So if you want to move beyond navigation controls and triggered events to incorporate user-input fields or evaluate variables, you will still have to grapple with Lingo

commands and syntax.

Director's score also features several productivity enhancements. The number of animation channels is up from 48 to 120. You can open multiple windows into a complex score, scrolling or zooming to different positions in the timeline to get simultaneous macro and micro views of your project. A sepa-

simply select the animation channel and move the appropriate start and end points. You can also incorporate selectable and editable keyframes into the score. Director automatically tweens the specified attributes (such as position, size, color, or opacity) across the intervening frames.

In keeping with Macromedia's Internet strategy, Director 6 can directly export Shockwave movies for playback in any browser that supports the Netscape plug-in or Microsoft Internet Explorer ActiveX protocols. Streaming technology, support of ActiveControl and Java Script, and specific Lingo commands for Internet functions make Shockwave movies faster and more interactive.

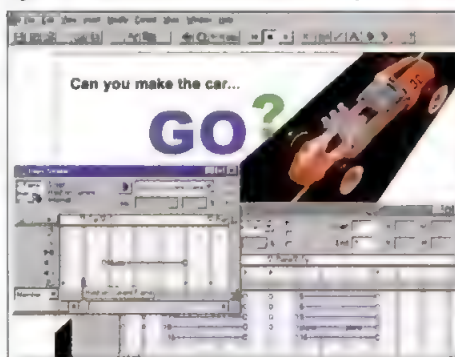
Macromedia no longer sells Director as a standalone product. The suite's accompanying programs—Macromedia Extreme 3D, Macromedia xRes, and Sonic Foundry's Sound Forge Xp—enable you to create 3-D, bitmap, and sound cast members for your movies.

These programs, however, are ancillary to Director. Simply stated, Director 6 is the most powerful tool for Internet developers and the most accessible authoring environment for non-programmers.

**Macromedia Director 6 Multimedia Studio.** Street price: \$1,000 (upgrade to Studio, \$500; upgrade to Director, \$400). Requires: 486/66 processor, Microsoft Windows 95 or Windows NT 4.0, 16MB RAM, 85MB hard disk space, CD-ROM drive, Sound Blaster-compatible sound card, SVGA graphics adapter. Macromedia Inc., San Francisco, CA, 800-326-2128, fax: 415-626-0554, [www.macromedia.com](http://www.macromedia.com). Circle 404 on reader service card.

rate, collapsible part of the score contains the effects channels, which control global events (such as tempo changes), transitions between scenes, soundtracks, and behaviors assigned to frames.

Most important of all, the new object-oriented sprites appear in the score as single entities that span frames. So it's a breeze to change an element's appearance and duration in the movie—you



**SPECIAL EFFECTS:** Director's Score window is much easier to use, thanks in part to a playback shuttle that indicates the current frame.



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# First Looks

## DIGITAL CAMERAS

### Camera Convergence

*Nikon's Coolpix 300 Personal Imaging Assistant does more than your average camera.*—By James Karney

**N**ikon's new Coolpix 300 (\$700 street) is more than a digital camera. According to the vendor, it's also a Personal Imaging Assistant. In addition to capturing 640-by-480 stills, it can record audio, let you overlay handwritten annotations directly onto files, and stand in as a video-conferencing camera.

The front of the camera features a fixed lens with a 1/45- to 1/10,000-second shutter, an optical viewfinder, and a microphone. The rear holds a speaker and a 2.5-inch LED display, which serves as a user interface, viewing screen, and writing pad.

The on-camera LED interface is straightforward and can be used with either the stylus or your finger. You can view the current video feed and re-view images as thumbnails or single pictures (you can also view them four at a time). If you want to capture 134 images—the maximum that can fit in Coolpix's 4MB of flash memory—without draining the 4 AA batteries, then leave the LED closed and stick to the viewfinder.

The area of the final image is larger than what you see through the viewfinder, so it takes some practice to fill the frame. Although Nikon states that you can come in as close as 5.5 inches, testing showed that we could get as close as four inches and still capture a usable image.

Pictures taken with good lighting display adequate contrast and color for a 640-by-480 image. Color balance and saturation are admirable, and the lens gives a sharp image under proper shooting conditions.

When using the flash, however, we found exposures were often delayed when the shutter was



**FIGURE 11:** Nikon's Coolpix 300 records audio (above) and allows simple image editing.

note by hand over a picture is just as easy: Simply bring the captured image full-screen on the LED display and then write with the stylus or your finger.

depressed, making it difficult to shoot fast-moving events at their peak.

Images viewed on-screen (especially after a touch-up in Adobe PhotoShop) are well-suited for Web pages and anywhere else you would traditionally use low-resolution digital images. Contrast is a bit flat in printed output but pleasing when viewed on a monitor. Enlargements were about average for 640-by-480, blurring into pixels at about 3X magnification.

The 17 minutes of .WAV audio files that can be stored in the Coolpix have sound quality that approximates a minicassette recorder—that is, it's acceptable for voice annotation and note-taking. You can set the camera to record sounds automatically while an exposure is being made, or you can record sounds on the fly by pressing the microphone button. Writing a



Through its composite interface, the Coolpix 300 performs well as an online video camera and conferencing source for programs such as CU-SeeMe. We attached the camera using an ATI All-in-Wonder

graphics card without a hitch, and we also managed to get a steady video signal.

We do have some minor complaints, though. The cable included in the kit barely reached from the back of our PC to the desktop, and there is no tripod socket.

Software bundled with the Coolpix includes NikonView (for simple image editing and for moving files from the camera to a PC or Macintosh), InMedia's Slides and

Sounds, and Picture Work's Photo Enhancer 3.2. Photo Enhancer is an adequate package for casual image editing. It offers a collection of basic tools for adjusting contrast and color balance using preset values.

Pictures are captured in JPEG format, audio as .WAV files, and handwritten overlays as Windows .BMPs. Each file can be stripped from the rest of the record and then manipulated and saved by itself.

If you plan on more than just casual use of the Coolpix, consider adding the \$150 (street) SCSI interface to speed up the slow serial-interface file transfer. The SCSI port can also handle TWAIN captures. An A/C adapter is also included with the SCSI cable.

At \$700, the Coolpix 300 could be considered an expensive digital camera. But given the range of tasks it performs and its ability to double as a video camera, this little package may be just the companion for users who want more than point-and-shoot.

**Coolpix 300.** Street price: \$700. Nikon Inc., Melville, NY; 800-526-4566, fax: 516-547-0305; [www.nikonusa.com](http://www.nikonusa.com). Circle 406 on reader service card.







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# First Looks

## MULTIMEDIA PRESENTATION SOFTWARE

### Multimedia Makers

*Two inexpensive software programs let you create great presentations in minutes.—By Alfred Poor*

**D**igital cameras, inexpensive color scanners, and enormous collections of multimedia clip art give you all the pieces you need to make impressive presentations, but how do you get started? Your only choices used to be expensive presentation programs or simplistic utilities that provided few features and little control.

Two new programs priced under \$70 give you some attractive, brand new choices: InMedia's Slides & Sound Plus and NEC Systems Laboratory's NetMC.

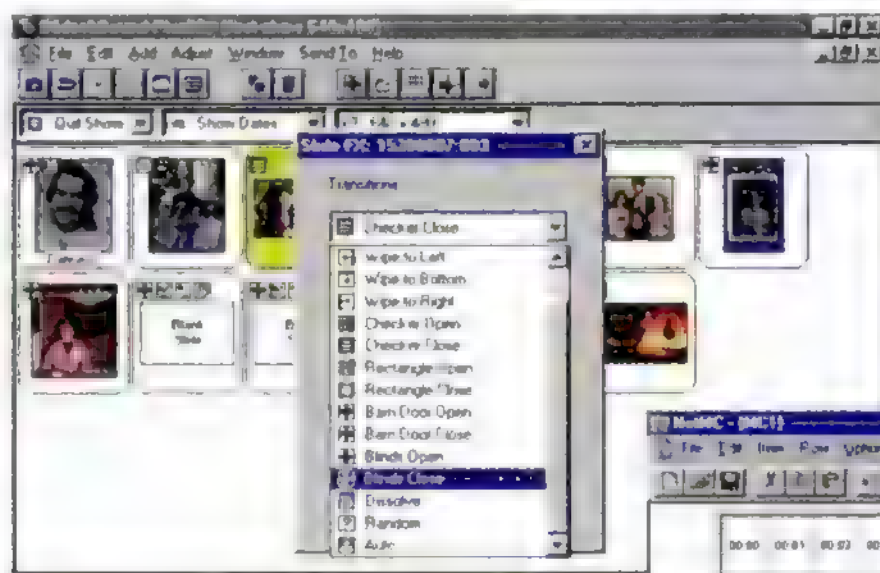
#### SLIDES & SOUND PLUS

The primary goal of Slides & Sound Plus (\$69.95, list) is to help ease the creation of self-contained presentation files. Based on a slide-sorter metaphor, the program assembles a sequence of images in a wide range of formats, including .BMP, TIFF, GIF, and JPEG. There is a range of transitions to choose from (including wipes and dissolves), and you can use either a timed delay or a mouse click to control the advance to the next image. A feature for building simple bullet-slide sequences is also included. You can add captions to your images, and you can also have .WAV sound files and QuickTime or AVI animation files play once the image gets shown.

Your presentation is saved as an executable file (animation files are not included) that can be played back by simply running the program. This feature is handy, because it means you do not need the entire program in-

stalled in order to play the presentation. You can even send a collection of images to someone else via e-mail.

Slides & Sound Plus has some significant limitations, though. First, presentation files get large quickly: A VGA-resolution program with 13 images and one brief .WAV file was over 4MB



**SMOOTH TRANSITION:** Slides & Sound offers a wide range of transitions that you can use between images.

when complete. Many e-mail systems will not accept files larger than 1MB, so you would have to break a file like this into multiple, smaller files. Also, all events must be complete before advancing to the next image. This means that you can't have one long .WAV sound file playing in the background behind a sequence of images.

#### NETMC

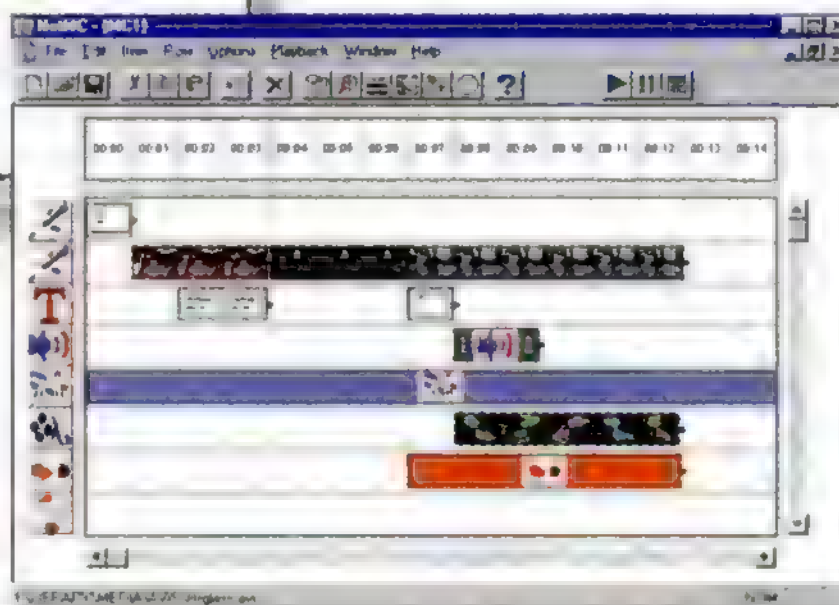
NetMC (\$59 list price) takes a completely different approach to building multimedia presentations. Instead of being based on single images, the program uses an underlying time track to coordinate events. You can determine when you want a given image to appear or disappear, and you can define simultaneous tracks for

the same type of media. For example, you can have one image appear on screen for a few seconds, and halfway through you can have another one appear that stays on-screen after the first one is removed.

This timing feature is not as sophisticated as those used in more expensive multimedia authoring packages. It cannot account for the fact that the sequencing may fall behind and that some images may take longer to load from disk; nevertheless, the timing feature is effective and useful.

You can define tracks for still

images, text, digitized sounds (.WAV files), MIDI tracks, animation clips, and even audio CD tracks. There is also a handy logic track that allows you to click on hot spots on



**ANIMATE IT:** NetMC uses a timeline structure to create overlapping events.

the screen in order to jump to other locations in the presentation. A Page Layout view lets you use the mouse to drag images to the desired location and size on-screen; you can also enter coordinate values by hand.

Unlike Slides & Sound, the component files are not included in the presentation file; you have to copy them all if you want to make a copy of the presentation (although there is an automatic grouping function). Fortunately, a Project function lists all of the files in a presentation along with their locations.

NetMC comes with 4,000 items of clip media, including a few MIDI and animation files. The bulk of the items, however, are short sound effects and typical clip-art illustrations.

NetMC and Slides & Sound also feature different presentation deliveries. With NetMC, you can view a presentation using the program or your Web browser (with the proper plug-in installed). You can embed a presentation in a Web page using a few lines of HTML code, and the program even comes with a half-dozen examples you can use as the basis for your own designs. NetMC can also embed its presentations in Microsoft's PowerPoint 97 files using ActiveX.

If you're looking for an easy way to send multimedia postcards, Slides & Sound Plus is an inexpensive and convenient way to piece together self-ex-

ecuting presentations. For a little less money, NetMC is more sophisticated and includes a much larger collection of clip media, which can add some pizzazz to your home page or PowerPoint presentations. **Slides & Sound Plus.** List price: \$69.95. Requires: 486SX/

66, Microsoft Windows 3.1 or 95, 8MB RAM (16MB recommended), 20MB hard disk space, sound card, CD-ROM drive. InMedia Presentations Inc., Vancouver, British Columbia, Canada; 604-893-8955, 888-575-4337; [www.inmediapresents.com](http://www.inmediapresents.com). **Circle 402 on reader service card.** **NetMC.** List price \$59. Requires: Pentium PC, Microsoft Windows 95 or NT 4.0, 16MB RAM, 10MB hard disk space. NEC Systems Laboratory, San Jose, CA. 888-223-4385, 408-433-1358; [netmc.neclab.com](http://netmc.neclab.com). **Circle 403 on reader service card.**



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# Second Looks

## CANVAS

### A New Approach

Just one day after the cover date of our April 22 issue (in which we reviewed illustration software), Deneba Systems released an update to its product Canvas 5. Version 5.0.2 was immediately shipped to all registered users. The update has added some improvements and—more significantly—addressed a number of problems that were affecting reliability and stability. Had this update been available in time for our roundup, the product would have compared more favorably with the others.

Deneba has addressed problems with Canvas and has made fixes available to its users. The vendor's Web site ([www.deneba.com](http://www.deneba.com)) contains a lengthy list of resolved issues, including many that could cause the program to crash or hang. Canvas 5 users who have not updated to Version 5.0.2 should do so; at the very least, they should examine the list of fixes to see whether a particular problem they've been having has already been resolved.

We noted a number of problems with Canvas 5 in our review. For example, we reported that a test file (the *PC Magazine* logo) was not imported properly. In Version 5.0.2, however, we were able to import the logo without a problem. We had also observed that switching the display to wireframe mode caused some objects to disappear. With Version 5.0.2, we were not able to duplicate the problem using the original test files.

In our review, we also noted problems we had with crashes as well as difficulties with the display. When we tested Version 5.0.2, we encountered not

a single crash and no anomalous behavior indicating any stability problems. We did observe a few minor display problems (for instance, missing pixels in gradient fills), but these did not have any effect on the illustration or our ability to work with it.

We also judged Canvas's display performance as being below average at a time when competing products had improved markedly. Version 5.0.2 has a new feature called Image Proxies that speeds up screen redraws of large, high-resolution images. Version 5.0.2 redraws most illustrations rapidly, but when we duplicated the gradient fill redraw test from our review we got a similarly slow result.

In our roundup's Summary of Features table, Canvas's most glaring weakness involved its Web support. Version 5.0.2 improves slightly on this; with the new version, you can import and export transparent GIF files. Deneba also offers Colada, a free Canvas plug-in that provides a much greater degree of support for the construction of Web pages. Colada is currently in beta and is available at Deneba's Web site. When complete, Colada will be shipped with Canvas.

We occasionally review a product like Canvas that does

not fit neatly into any one category. In April, we reviewed desktop publishing, image-editing, and illustration tools. Canvas can do all three jobs; we reviewed it as an illustration program that can do desktop publishing and image editing.

An integrated software package goes a bit against the grain in the graphics market.

For years, graphics pro-

fessionals have used a different product for each individual task, so it's easy to view an integrated product with a wary eye. Nonetheless, Canvas is competitive as an illustration tool. It does not lack any major features, and it works as advertised. The same can be said of Canvas's image-editing side. The product is probably less competitive in the desktop publishing arena when compared head to head with the likes of Adobe PageMaker and QuarkXpress, but it is well beyond the capabilities of the entry-level products that can be

found in that category. An integrated product like Canvas requires an investment on the user's part. Deneba claims that those who are willing to explore a new way of working will get the advantages that Canvas has to offer. The vendor may be right, but with the habits of nearly two decades' worth of graphics professionals to cope with, Deneba may have a difficult time getting that mes-

sage across. A quick check with a few graphics professionals who like to use Canvas confirmed both their devotion to the product and the benefits of integration.

Deneba has one compelling edge with this product. Canvas's street price of \$400 is right in line with the rest of the illustration packages we reviewed. The product even comes with image-editing and desktop publishing features as well. So if you are

among the economy-minded, Canvas 5.0.2 might just be a good fit.—Will Fastie

**Canvas 5.0.2.** Street price: \$400; 5.0.2 upgrade free to registered Canvas users. Requires: Pentium-based PC, Microsoft Windows 95 or NT, 16MB RAM (24MB for NT), 35MB hard disk space, CD-ROM drive. Deneba Systems Inc., Miami; 800-622-6827, fax, 305-273-9069; [www.deneba.com](http://www.deneba.com).

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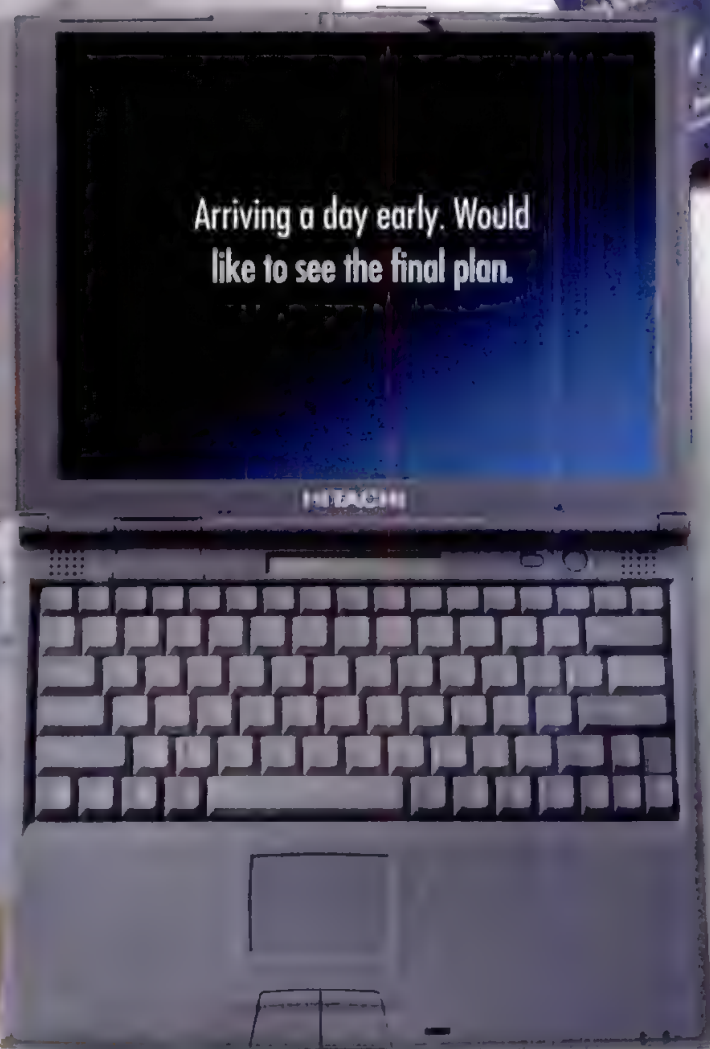
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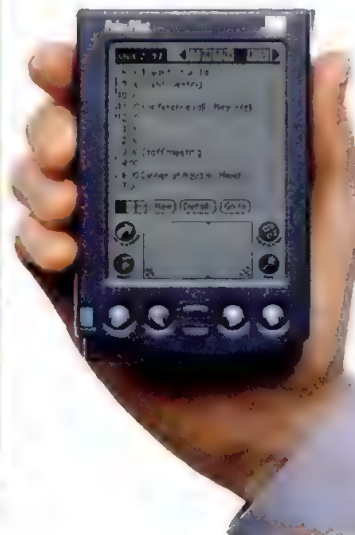
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# Put a Little Zoot in Your Day

Everyone wants to be better organized. Some people even buy computers for just that reason. Then they find out how hard it is to maintain their records. Despite all the help that software gives us, getting and staying organized is a discipline—a collection of good work habits.

As the quantity and the quality of online information increase, the Web has become one of the most important ways of doing research for many of us. We can shop for products, ideas, data, competitive information, or advice. One of the biggest challenges, however, is making sense of it all. How many times have you been to a site that had just the information you were looking for and then forgotten to make a note of the URL? Your browser's history file had the link—or maybe it didn't. But finding it in the morass of URLs and poorly named pages can be tricky. Or maybe it's just gone, expired.

Separating the wheat from the chaff in newsgroups can be even more frustrating. Despite the terrific features of newsgroups such as Agent and Anawave's Gravity, it can be tough to find the gem of information or the one person to whom you want to send a follow-up e-mail.

Quite apart from the Web, you're brainstorming new ideas for a product, a presentation, or a family reunion. Like many of us these days, you think best with your fingers on the keyboard, letting the ideas flow and recording them at the same time.

Wouldn't it be nice if a program lurked in the background, watching and recording your activities, and then gave you all the tools you needed to categorize and annotate them? Meet Zoot, an extraordinary product that's part PIM and part text database, note editor, activity tracker, and abstract builder. Zoot uses the Windows Clipboard to snag information from any Windows application, but it has a special affinity for your Web browser, automatically capturing all the URLs you visit. When you're done, Zoot shows you a three-pane view of your day's work: folders, links, and notes. It's only a moment's work to delete the links you don't want, move or copy the ones you do want into categorizing folders, and annotate them in attached note windows.

Then the fun begins. You can search the library folders that you've built by surfing and culling, or you can use Zoot to call up any and all of the Web search engines via your

browser. A utility feature called Agent X can search all the drives attached to your machine, making quick work of extracting information you'd previously gathered. When Zoot searches, it can generate abstracts from the files that match your search criteria. You can choose the size of the abstract—from 50 to 4,500 words.

They're actually excerpts, not abstracts, as Zoot isn't aware of syntax. But it will find multiple occurrences of a word or phrase within a big file and pull out the relevant section for your later reference.

Zoot is often compared with Lotus Agenda, a long-discontinued DOS-based PIM that gained many strong adherents while baffling countless others. Agenda let you set up categories and cross-references and then stored and filed them by person, project, date, client, or whatever criteria were chosen. You could shift views easily, so that the relevance of the information Agenda displayed was always at its greatest. Agenda had two main problems: limited interoperability with other applications and a steep learning curve. If you didn't use it for a while, you were apt to forget some of its subtler features. Executive editor Bill Howard was a big-time user of Agenda. Bill and I once conducted a Q&A panel at a user-group meeting. Someone asked Bill, "How long did it take you to learn Agenda?" His response: "You mean—so far?"

Zoot is similarly rich in features, more powerful in most ways, and far more relevant to the kind of computing and information retrieval that most of us do today. But it's not the kind of program that you just play around in until you figure out how it works. Zoot will work best for you if you approach it methodically, learning its functions and testing its powers on sample files that you download from its Web site ([www.zootsoftware.com](http://www.zootsoftware.com)).

The biggest question with any PIM/organizer is whether it's right for you and for the way you work. Though Zoot's price (\$79.95) won't put too big a dent in your budget, the best thing about it is that it's shareware. So if you don't like it, just delete it from your drive. **PC**



## GETTING ORGANIZED

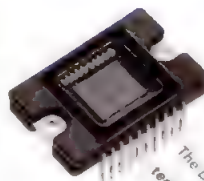
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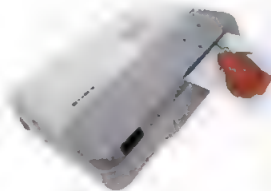
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**SONY**



# In Bed with Apple, Intel, and Microsoft

**R**umors rampaging through Silicon Valley were corroborated by new revelations about the likelihood that the next version of the Macintosh will contain a Windows NT kernel. Also clarified were a number of informational anomalies, including the weird

pronouncement by Bill Gates that Motorola would be out of the microprocessor business in two years (Inside Track, October 21, 1997). Let's go over each of these issues one by one to make sense of it all.

1. The rumor in the Valley is that Apple will adopt the Intel microprocessor. The reason is obvious: price. This move would also allow Apple to make a computer that could run both an Apple OS and a Microsoft OS.

2. It's believed that the Mac OS has already been ported to Intel. This may actually be the motive behind Apple's \$400 million buyout of NeXT Software, as that company has long since put its OS on Intel chips. The Bill Gates/Steve Jobs coannouncement at MacWorld was made solely to firm up the real deal, which was the development of a Windows NT kernel for a Mac shell. Microsoft's \$150 million will be used for development costs.

3. Apple is pulling the plug on licensing deals. As part of the pact with Microsoft and in exchange for the development money and the Windows NT license (actually all technologies were co-licensed by both companies), Apple will agree *not* to license the Mac OS shell and to use it only on Apple-made machines.

4. This might also explain why Jean-Louis Gassée is rumored to be putting his BeOS onto the Intel platform. He has remained close to Apple and surely knows of any secret plans to dump Motorola.

These are the radical steps that are needed to save Apple; the company shouldn't have to continue to fight an uphill battle against the Wintel platform. With AMD, Cyrix, and a slew of other companies coming online with Intel-compatible chips, there is no reason to fight the real market trends with the PowerPC and its never-ending promises.

With an Intel-based machine running a new Mac OS, Apple can continue the support of its original platform and produce a serious Windows machine, as well offer the option for both platforms. Best of all for Apple, it can cut back on motherboard-design development efforts.

The real kick in the marketing pants comes from offering a Windows machine that would have the possibility of

running a true Mac OS. That simple option might be worth a premium. In past columns here and elsewhere I've advocated that Apple develop and market a pure Windows machine. But I never took it to the next logical step: completely dump the Mac architecture and go entirely over to Intel.

In its current configuration, the Mac runs Windows in emulation and therefore will never perform properly. Too much of the Windows performance is tied up in elaborate graphics controllers that are optimized for Windows graphics. These speedy cards cannot be used in a Mac and cannot be duplicated in emulation. If you dump the entire Mac architecture and start with a PCI-based Intel system, then you can have the best of both worlds. Most of the graphics card companies were already preparing for a PCI-based MAC CHRP (Common Hardware Reference Platform) and can make a Super VGA card that would scream under both Windows and the Mac OS.

This idea is a stroke of genius if properly executed. Most Mac users are primarily concerned with running their old software and will squawk only for a short time during a chip transition. Mac users have traditionally added high-performance boosters in the form of add-in cards with on-board processors, and we can assume that power users will add PowerPC cards into the Intel machine and manage some sort of multiprocessing if necessary. Windows NT can do this. It can also multitask, something that has

been sorely needed in the Mac world.

What's most interesting is the effect that this change will have on big players such as Dell and Gateway. A Wintel/Apple alliance will have great appeal, and if Dell and Gateway are not allowed to sell Mac shells, they will complain bitterly. The possibility exists that Apple will sell the Mac OS on an individual basis, with money for the kernel somehow going to Microsoft. I suspect that the sales would be made in some way so that Microsoft gets more of the OS pie than it does now.

If Gates and Jobs can avoid double-crossing each other, we may see Apple back in the game in new ways.



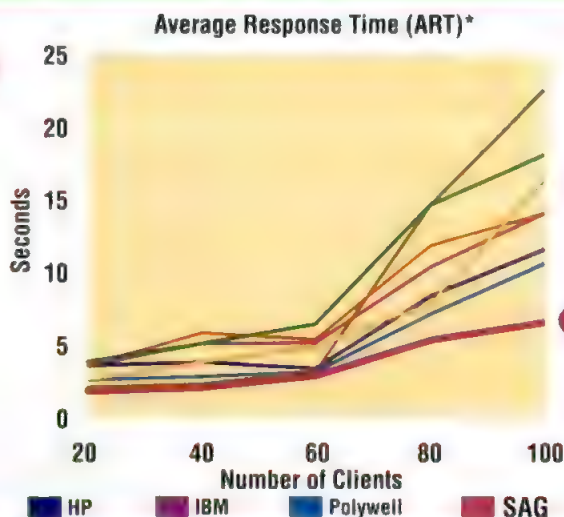
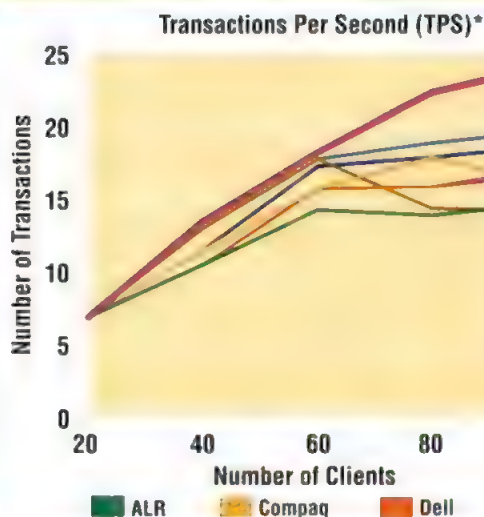
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# Inside Track

**L**ook for a reemergence of **disk drive wars** later this year and continuing into 1998. They will be **triggered** by the final entrant into the magnetoresistive (MR) head club, Western Digital. The MR head increases the capacity of hard disks by a factor of five to ten, and Western Digital has been the last holdout. Western Digital is the company that drives prices down. I'm told by disk manufacturers that it's even likely that the **9GB drive will be standard** issue in 1998, and one person told me to expect to see **20GB drives selling for under \$500** by late 1998. The first MR drive from Western Digital will incorporate 2.16GB on a single platter. My primary drive is a 9GB Micropolis drive, and it's a welcome relief to have such capacity available. And, in case you haven't noticed, **software bloat** is worsening.

**Readers' Challenge Dept.:** It looks as if Moore's Law applies to disk drives just as it does to processor performance. Moore's Law says that performance will double every 18 months. I wonder what the law implies about software bloat? If any engineer out there can show me the bloat factor of software since 1976 (or before!) I'd be interested to see if it follows Moore's Law. Early word processors, such as the Electric Pencil, easily fit on 70K floppy disks. I'll reprint the results (with credit) to anyone submitting solid evidence matching bloat to Moore's Law and rename it **Moore's Bloat**.

**The DVD-RAM situation keeps fluctuating.** It's quite annoying, but the 4.7GB writable format may be the one to get. This seems to be the most likely format to be compatible with the most drives. But that will probably change next week. So—uh—never mind.

**Microsoft Is Up to Something Dept.:** Remember the Microsoft operating system called Bob? Well, now Microsoft is introducing a product called "Bob and Weave," which has nothing to do with Bob. Bob and Weave, a part of **Microsoft's Entertainment PC 98** specification, is a couple of algorithms designed to make viewing full-motion video from movies on DVD doable on the PC at resolutions higher than normal. The idea is that with the higher resolutions of a modern PC monitor, you should be able to get a "better" television experience than you can with a standard or even an enhanced TV. I suspect that this idea will be carried over to the upcoming generation of **digital TVs** and projection systems. A report in *EE Times* indicated that Bob and Weave may be similar to the pricey Faroudja Laboratories Line Doubler and **Super NTSC system**, which makes any NTSC signal

*Moore's Law says that performance will double every 18 months. I wonder what the law implies about software bloat? If anyone can show me the bloat factor of software since 1976 I'd be interested to see if it follows Moore's Law.*

approach HDTV quality using mathematical trickery.

I'm always skeptical when Microsoft tries to get into the home space. Microsoft started years ago with the **MSX fiasco**, whereby it was going to key into a slew of consumer electronics products interfaced to computers, based on 8-bit technologies. Nothing came of it. More recently there was the hyped **Microsoft at Home** and the subsequent Microsoft at Work. Although many knowledgeable designers felt that these specifications were wondrous pieces of design, they fell flat. **Nobody was interested.** Now we have the Entertainment PC 98 specification. We'll probably hear more about this next year. Do these people at Microsoft ever sleep?

Another company working in this arena is ATI Technologies, one of the leading display-card makers. It's committed to multimedia—and DVD in particular. ATI has finished work on a **soft DVD system that bypasses the need for MPEG-2 chips** on the graphics cards or motherboard. Currently, you'll need a Pentium II running at 233 MHz for full 24-frame-per-second decoding of a DVD video stream. We can assume that software MPEG-2 decoding will dominate the PC market, since it saves the consumer around \$150 per machine. ATI has recently released the All-In-Wonder Pro, a **very cool graphics controller**, which incorporates a TV tuner on the card itself, as well as a slew of 3-D and other functions. Highly recommended.

**Genuinely Interesting Hardware Dept.:** If you're looking for a set of fantastic-sounding speakers for your PC, I recommend the **Incredible \$100 PC-Works system** from Cambridge SoundWorks. You get two satellite speakers, a subwoofer, and a built-in **bi-amplification** system. It's an amazing deal, and I was **stunned** by the quality. Cambridge SoundWorks sells both direct through its catalog and through 27 factory stores located mostly in New England and California. Call the company at 617-332-5936 to find a nearby store or to get the catalog. Heck, just order these speakers. They're fabulous.

I've always believed that Cambridge SoundWorks' operation should be **copied** by computer companies. **There should be Gateway 2000 stores, for example.** Computer companies have been reluctant to do this because of the failure of the CompuAdd stores, which were simply too big to sustain themselves. Mistakes were made. Cambridge SoundWorks stores are comparatively small and efficient. No major computer company has tried this, despite the fact that small Taiwanese-owned clone shops thrive on the West Coast and elsewhere. **PC**



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# RAID Grows Up...Er, Down

**O**n its tenth birthday, RAID has suddenly come alive. First proposed by a trio of researchers at University of California at Berkeley a decade ago, RAID—Redundant Array of Inexpensive Disks, or Redundant Array of *Independent* Disks in recent years—has come

out of the Glass House and is showing up on more modest systems. New products, our new dependence on PCs and PC servers for important core-business functions, and some new ideas about RAID have all contributed to the RAID explosion.

The idea behind RAID is simple, if the technology isn't. By spreading stored data across several hard disks instead of only one, you can get both faster performance and much greater data security—if you set things up right. First, a quick RAID primer, then on to some specific product recommendations.

The academics who came up with RAID proposed six standards, RAID 0 through 5. Since then, practice has added some cross-type variations, such as RAID 0/1 and Dynamic RAID 3/5. The differences are intended to address specific data-storage and system-performance demands; in practice, some of the specs, such as RAID 2 and 4, are little used.

In RAID 0, successive parts of your file are spread across two or more disks, a technique called *striping*. By storing data on several physical disks (*multiple spindles* in the vernacular), subsequent reads are faster, since the file can be read into memory from several places at once, without requiring the heads of one drive (spindle) racing all over that disk, rounding up your data. RAID 0 provides higher performance but no extra security.

RAID 1 writes data twice, simultaneously, to two drives—the second a mirror of the first. This provides no performance increase but great safety: If the first disk claps out, the second is immediately available.

RAID 0 and RAID 1 require a minimum of two drives.

RAID 0/1 combines the two techniques, with data striped across a minimum of four drives. RAID 0/1 can be a good compromise.

RAID 3 byte-interleaves data across several drives, with only parity information stored on one of those drives. RAID 3 is a great choice for fast workstations.

RAID 5, my recommendation for the most robust improvements in performance and security for servers and

critical-app workstations, distributes both data and parity information across at least three drives, preferably four.

Arrays of RAID drives use a special kind of SCSI controller card to manage the process, and many RAID controllers include on-board cache memory.

Strictly speaking, you don't need a RAID controller; you can get feeble RAID-like data protection in many operating systems, including NetWare and Windows NT. This is usually RAID 1—like disk mirroring. But RAID in software is a joke: Whereas RAID is all about protecting you from hardware failure and improving performance by breaking up large files, the operating-system variety of RAID handles the former with only modest success and ignores the latter.

If you're serious about RAID, you want a hardware solution—not only for the performance and data security advantages but for the RAID 0—management tools that good hardware RAID setups provide. For example, you can keep an extra disk or two installed as “hot spares,” which are automatically brought online if a disk in your array fails—and the data from the failed drive is automatically, transparently rebuilt on the new drive.

Today, most of us mount multiple hard disks in our servers, so internal RAID arrays are most common. It's also easy to set up a separate, external RAID-array chassis next to a server and run that external array from a controller on the server's PCI bus. While it's probably

more convenient to use internally mounted drives in a server, you're obviously limited to the number of drive bays in that server; external-array chassis can be found that hold a dozen or more hard disks. In a desktop PC or mini-tower workstation, you may not have any choice: You probably won't have more than two or three available drive bays.

The competition has always been tough in the RAID-controller business, with Adaptec, Mylex, and DPT all claiming performance leads.

Mylex ([www.mylex.com](http://www.mylex.com)) has recently introduced its new RAIDPlus, an add-on to its regular line of FlashPoint SCSI adapters that lets you add simple forms of RAID (0, 1, 0/1)



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If you run any kind of server, including a Web server, you need RAID. The payback is huge.

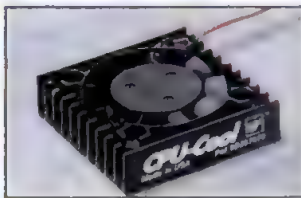


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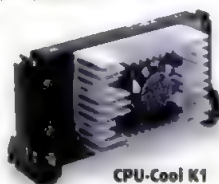
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## JIM SEYMOUR

to those cards. RAIDPlus-enabled FlashPoint controllers are priced the same as standard FlashPoint cards.

DPT ([www.dpt.com](http://www.dpt.com)), which in my experience has taken absolute performance farthest in the RAID world, has several new products including an inexpensive external RAID array called RAIDStation, a three-disk box that comes complete with a DPT SmartCache IV controller for just \$1,295, without disks. With sufficiently large hard disks—remember that there's room for only three, so expanding capacity after your purchase means adding yet another daisy-chained RAIDStation—this can be a great, cost-effective way of adding RAID to a workstation.

DPT also has a new ServerOnCall RAID controller card that lets you set up a separate server as an immediately available backup for one or more of your existing servers. (Think clustering and you'll get the idea.)

Maybe the most interesting move lately in RAID has been Adaptec's rejiggering of its line of RAID controllers. Adaptec ([www.adaptec.com](http://www.adaptec.com)) has rolled out two new cards, the single-channel AAA-131 and three-channel AAA-133. These aggressively priced cards offer superb performance and easy installation that has long been characteristic of Adaptec, the gold standard in SCSI adapters. The 131 comes in at under \$475, the 133 at about \$200 more: great buys, with hot performance and superb RAID management software, too.

I've been testing the AAA-series RAID controllers on several servers, and I'm impressed. I especially like the idea of an affordable three-channel RAID card. This lets you later add external RAID arrays to your initial internal array as your need for storage capacity grows. It also lets you segment slower devices—a CD-ROM tower, say, or a scanner, or Jaz or Zip drives—on the second or third channel. You can buy the AAA-133 for about \$675, an astonishing price for a high-performance RAID controller.

Don't be fooled by Adaptec's designation of the AAA-series controllers as "entry-level" devices. They're positioned that way to help protect Adaptec's high-end line even though they're high-performance RAID systems.

If you run any kind of server—including a Web server—today, you need RAID. And if the new 300-MHz Pentium II boxes are leading you to think about moving to x86/Windows NT workstations, think about adding RAID arrays to those workstations. The payback is huge. **PC**

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# Not the Same Old Tune

**Y**our PC's sound is about to experience the same revolution as automotive sound did a decade ago: If you want quality, you may do just fine with a factory-installed system. But to surpass what's available on better PCs, you'll have to go higher into the pricing

stratosphere. *PC Magazine* will cover sound and technology a few issues down the road. Meanwhile, here are some thoughts to consider if you're in the market now.

We're seeing three types of sound on PCs. First, there's basic business audio on systems sold for the corporate workplace. Even IS managers who aren't sure that sound makes sense at all leave open the possibility that it will matter over the lives of the PCs they're buying today. So the path of least resistance for them is to specify a minimal level of sound support. Ideally for business users, the speakers are built into the monitors, keyboards, or system units to reduce desktop clutter.

Second, there's audio for individual buyers. At the low end, typically below the \$1,500 selling price for a system, we still get mediocre and sometimes truly awful audio with what are often called *courtesy speakers*—products worth less than \$5 and bundled in just so the vendor can sell a "complete multimedia solution."

Finally, beyond \$2,000, the audio improves—with respect to both the sound board inside and the speakers outside. And with enthusiast systems (\$2,500 and up), you'd probably have to spend \$250 on speakers to get noticeably better sound. PC vendors are teaming up with known speaker vendors—including Bose, Boston Acoustics, Cambridge SoundWorks, and JBL—to draw on their engineering expertise and lend cachet to their systems.

I've been especially impressed by the work done on 3-D audio this year. It's now possible to provide the impact of a five-speaker Dolby Pro Logic or Dolby Digital home theater from just two channels. Voices really do come from the center of the screen, and airplane flyovers really do seem to move from front to rear. You have to be seated on-axis, meaning directly in front of the monitor, however, to get the full effect. If two people sit side by side, each misses part of the impact.

What's missing—thankfully—is the artificiality of early 3-D, which paralleled the artificiality of some stereo records of the 1960s. What seemed like more—seemingly more

sound, more spaciousness—turned out to be less realistic. Even if you were not an audio expert and couldn't explain why, you eventually found the sound fatiguing. It's hard to argue that the sound of a phaser was unrealistic with too much 3-D—after all, what *should* a phaser sound like?—

but with music it's a different matter.

Is 3-D sound important? It depends on who you are. For gamers, it will absolutely enhance the gaming experience. It will make children's edutainment titles more engrossing. And of course, it will enhance the experience of full-length DVD movies played on your PC. I suspect, however, that few people will be watching DVD movies on PCs more than once or twice.

The other enhancement we're seeing is better-quality sound adapters, especially on higher-end systems. FM synthesis is giving way to affordable wavetable sound—sampled sounds of actual instruments that are stored on the sound adapter—on most nonbusiness PCs costing \$2,000 and up. At the same time, we're seeing better-quality components on the better sound adapters.

There's at least one more hurdle in the way of ultimate PC-based audio—keeping the sound digital inside the PC. Analog sound is subject to electromagnetic interference inside the system unit. Audio should stay in digital form as it's mixed and processed inside the PC. The digital-to-analog conversion should take place at the end of the wire, at the speakers. That's

the advantage of USB (Universal Serial Bus) speakers, which are trickling onto the market now. Instead, a few vendors are championing S/PDIF, the Sony/Philips Digital Interface Format, which is available on high-end audio components. S/PDIF is already available on higher-end Creative Labs sound boards, and design shops such as Crystal Semiconductor are building in support for it on their audio chip sets. These chip sets also support true 5.1 Dolby Digital (five speakers, one subwoofer) in case you want to use your DVD-equipped PC as a front end for home theater.

Even if you were always a skeptic, there can be no doubt about it anymore: Convergence is here. 



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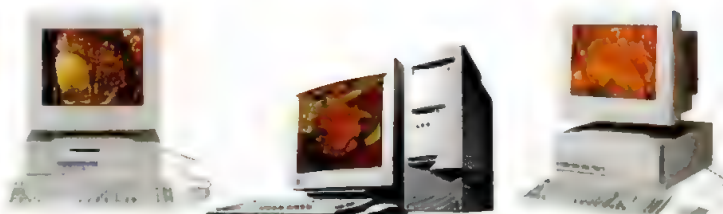


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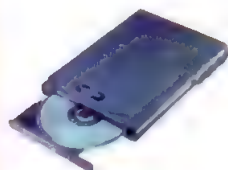
|          |                    |            |        |          |                     |           |                          |           |       |
|----------|--------------------|------------|--------|----------|---------------------|-----------|--------------------------|-----------|-------|
| 1530DM   | 133MHz Pentium MMX | 16MB/80MB  | 1.4GB  | 10X      | 12.1" dual scan     | 33.6K bps | full duplex speakerphone | \$1978.67 | 91507 |
| 1540DM   | 150MHz Pentium MMX | 16MB/80MB  | 2.1GB  | 20X      | 12.1" dual scan     | 33.6K bps | SVGA resolution          | \$2799.00 | 96613 |
| 1550DMT  | 133MHz Pentium     | 16MB/80MB  | 1.4GB  | 10X      | 12.1" active matrix | 33.6K bps | full duplex speakerphone | \$2899.39 | 87070 |
| 1580DMT  | 150MHz Pentium MMX | 16MB/80MB  | 2.1GB  | 10X      | 12.1" active matrix | 33.6K bps | full duplex speakerphone | \$3399.10 | 90959 |
| 1590DMT  | 166MHz Pentium MMX | 16/80MB    | 2.1GB  | 20X      | 12.1" active matrix | 33.6K bps | SVGA resolution          | \$3699.00 | 96612 |
| 4130T    | 133MHz Pentium     | 16MB/48MB  | 1.06GB | -        | 11.8" active matrix | -         | 16-bit stereo sound      | \$2459.43 | 71116 |
| 4131T    | 133MHz Pentium     | 16MB/48MB  | 1.4GB  | -        | 12.1" active matrix | -         | 16-bit stereo sound      | \$2495.26 | 80775 |
| 4150     | 150MHz Pentium MMX | 16MB/80MB  | 1.6GB  | -        | 12.1" dual scan     | -         | 16-bit stereo sound      | \$2899.34 | 91508 |
| 4160T    | 166MHz Pentium MMX | 16MB/80MB  | 2GB    | -        | 12.1" active matrix | -         | 16-bit stereo sound      | \$3899.06 | 91509 |
| 4160T SL | 166MHz Pentium MMX | 16MB/80MB  | 2GB    | -        | 12.1" active matrix | -         | 16-bit stereo sound      | CALL      | 96734 |
| 7330T    | 150MHz Pentium MMX | 16MB/128MB | 2.1GB  | -        | 12.1" active matrix | -         | 16-bit stereo sound      | \$3799.00 | 93735 |
| 7350MT   | 166MHz Pentium MMX | 32MB/128MB | 2.1GB  | -        | 12.1" active matrix | 33.6K bps | 16-bit stereo sound      | \$4499.00 | 93736 |
| 7710MT   | 150MHz Pentium MMX | 16MB/144MB | 1.6GB  | optional | 12.1" active matrix | 33.6K bps | 64-bit PCI bus           | \$3899.00 | 88242 |
| 7730MT   | 166MHz Pentium MMX | 32MB/144MB | 2.1GB  | optional | 12.1" active matrix | 33.6K bps | 64-bit PCI bus           | \$4399.00 | 88241 |
| 7750MT   | 166MHz Pentium MMX | 32MB/144MB | 2.1GB  | optional | 12.1" active matrix | 33.6K bps | 64-bit PCI bus           | \$4999.00 | 88240 |
| 7770DMT  | 233MHz Pentium MMX | 32MB/144MB | 3GB    | 20X      | 12.1" active matrix | 33.6K bps | 64-bit PCI bus           | CALL      | 96735 |

## Compaq Presario

|         |                    |           |       |     |                     |           |                     |           |       |
|---------|--------------------|-----------|-------|-----|---------------------|-----------|---------------------|-----------|-------|
| 1210    | 150MHz Pentium     | 16MB/80MB | 1.4GB | 14X | 12.1" dual scan     | 33.6K bps | 16-bit stereo sound | \$1999.00 | 90514 |
| 1610    | 150MHz Pentium MMX | 16MB/80MB | 1.6GB | 14X | 12.1" dual scan     | -         | 16-bit stereo sound | \$2699.00 | 90515 |
| 1620    | 166MHz Pentium MMX | 16MB/80MB | 2.1GB | 20X | 12.1" dual scan     | 56K bps   | 16-bit stereo sound | \$2999.00 | 95098 |
| 15850MT | 150MHz Pentium MMX | 16MB/80MB | 2.1GB | 12X | 12.1" active matrix | 33.6K bps | 16-bit stereo sound | \$3499.00 | 92232 |

## Fujitsu LifeBook

|       |                    |           |       |     |                     |           |                     |           |       |
|-------|--------------------|-----------|-------|-----|---------------------|-----------|---------------------|-----------|-------|
| 555Tx | 150MHz Pentium MMX | 16MB/80MB | 2GB   | 10X | 12.1" active matrix | 33.6K bps | 16-bit stereo sound | \$3199.00 | 85008 |
| 565Tx | 166MHz Pentium MMX | 32MB/96MB | 2GB   | 20X | 12.1" active matrix | 33.6K bps | XGA resolution      | \$4299.00 | 92055 |
| 635Tx | 133MHz Pentium MMX | 16MB/80MB | 2GB   | 16X | 12.1" active matrix | 33.6K bps | 16-bit stereo sound | \$3199.00 | 92058 |
| 655Tx | 150MHz Pentium MMX | 16MB/80MB | 1.3GB | 8X  | 12.1" active matrix | 33.6K bps | external floppy     | \$3799.00 | 85013 |
| 656Tx | 150MHz Pentium MMX | 16MB/80MB | 2GB   | 16X | 12.1" active matrix | 33.6K bps | SVGA resolution     | \$4299.00 | 92061 |



### MicroSolutions

**backpack bantam**  
12X CD-ROM drive  
• 1200KB per second transfer speed via enhanced parallel port  
• 150 ms typical access time  
• 21 ounces

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**With sound** **\$308.58** CDW 93109

### Microsoft

**Office 97 Professional Edition With Bookshelf Basics**  
Includes: • Microsoft Image Composer V1.5 (with Microsoft GIF Animator)  
• Microsoft Internet Explorer V3.0  
• Microsoft Personal Web Server  
• Microsoft Web Publishing Wizard V1.5

**Version upgrade CD** **\$48.26** CDW 96190

**CD** **\$134.91** CDW 96254

### Intel

**EtherExpress PRO/100**  
Mobile Adapter  
• 32-bit functionality with bus master architecture  
• Auto-senses network speed to run at either 10 or 100Mbps  
• Hot swappable  
• Includes full driver suite and SNMP management agent

**\$158.10** CDW 82786

### Sony

**pcANYWHERE 32V8.0**  
For Windows 95 and NT

**Host and remote** **\$59.60** CDW 93317

**Host only** **\$78.75** CDW 93320

**Remote only** **\$86.67** CDW 93322

\* After \$70 retail-in-manufacturer rebate. Resellers apply please call for details.

### brother

**MFC-7000C**  
So-in-one color multi-function center  
• 14.4K bps faxmodem  
• Up to 720 x 720 dpi printer resolution  
• Copies photos, charts and graphs from 3" x 5" up to 8.5" x 14" originals  
• Up to 1200 x 1200 dpi interpolated scanner resolution  
• 50 minute digital answering machine

**\$999.99** CDW 91650

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## Notebooks

| Model                     | Processor          | RAM std./max | Hard drive | CD-ROM | Color display       | Modem     | Features            | Price     | CDW   |
|---------------------------|--------------------|--------------|------------|--------|---------------------|-----------|---------------------|-----------|-------|
| <b>Hitachi VisionBook</b> |                    |              |            |        |                     |           |                     |           |       |
| 4150x                     | 150MHz Pentium MMX | 16MB/128MB   | 1.4GB      | 10X    | 12.1" dual scan     | 33.6K bps | 16-bit stereo sound | \$2299.00 | 91047 |
| 4360x                     | 166MHz Pentium MMX | 16MB/128MB   | 2.1GB      | 10X    | 12.1" active matrix | 33.6K bps | SVGA resolution     | \$3199.00 | 91049 |
| 7340                      | 133MHz Pentium MMX | 16MB/144MB   | 1.4GB      | 10X    | 12.1" active matrix | 56K bps   | 16-bit stereo sound | \$2999.00 | 91051 |
| 7360                      | 166MHz Pentium MMX | 32MB/144MB   | 2.1GB      | 10X    | 12.1" active matrix | 56K bps   | 16-bit stereo sound | \$4299.00 | 91053 |
| 7560                      | 166MHz Pentium MMX | 32MB/144MB   | 3GB        | 10X    | 13.3" active matrix | 56K bps   | XGA resolution      | \$4799.00 | 91054 |
| 8560                      | 166MHz Pentium MMX | 16MB/80MB    | 2.1GB      | 10X    | 13.3" active matrix | 56K bps   | XGA resolution      | \$4599.00 | 91056 |

### Hewlett-Packard OmniBook Notebook PCs

|         |                    |            |        |          |                     |   |                     |           |       |
|---------|--------------------|------------|--------|----------|---------------------|---|---------------------|-----------|-------|
| 800CT   | 166MHz Pentium MMX | 16MB/80MB  | 2GB    | -        | 10.4" active matrix | - | external floppy     | \$3679.99 | 85727 |
| 2000CS  | 133MHz Pentium     | 16MB/128MB | 1.4GB  | -        | 12.1" dual scan     | - | SVGA resolution     | \$2849.99 | 88749 |
| 2000CT  | 133MHz Pentium     | 16MB/128MB | 1.4GB  | -        | 12.1" active matrix | - | 32-bit PCI bus      | \$2844.25 | 88750 |
| 2000CT  | 133MHz Pentium MMX | 16MB/128MB | 2GB    | -        | 12.1" active matrix | - | 32-bit PCI bus      | \$3089.23 | 88751 |
| 5700CT  | 150MHz Pentium MMX | 16MB/128MB | 1.8GB  | optional | 12.1" active matrix | - | 16-bit stereo sound | \$3089.64 | 85720 |
| 5700CT  | 166MHz Pentium MMX | 16MB/128MB | 1.8GB  | optional | 12.1" active matrix | - | 16-bit stereo sound | \$4039.53 | 85721 |
| 5700CTX | 166MHz Pentium MMX | 16MB/128MB | 1.8GB  | optional | 12.1" active matrix | - | XGA resolution      | \$4098.82 | 85723 |
| 5700CTX | 166MHz Pentium MMX | 32MB/128MB | 2.79GB | optional | 12.1" active matrix | - | XGA resolution      | \$4619.09 | 85722 |

### IBM ThinkPad

|       |                    |            |        |          |                     |           |                     |           |       |
|-------|--------------------|------------|--------|----------|---------------------|-----------|---------------------|-----------|-------|
| 380   | 150MHz Pentium     | 16MB/80MB  | 1.08GB | -        | 12.1" dual scan     | -         | 16-bit stereo sound | \$1669.46 | 86302 |
| 380D  | 150MHz Pentium MMX | 16MB/80MB  | 2.1GB  | 8X       | 12.1" active matrix | -         | 16-bit stereo sound | \$2999.00 | 86305 |
| 380E  | 150MHz Pentium MMX | 16MB/80MB  | 2.1GB  | -        | 12.1" dual scan     | -         | SVGA resolution     | \$2099.36 | 94541 |
| 380ED | 166MHz Pentium MMX | 16MB/80MB  | 2.1GB  | 20X      | 12.1" dual scan     | -         | SVGA resolution     | \$2587.51 | 94542 |
| 380ED | 166MHz Pentium MMX | 16MB/80MB  | 3.0GB  | 20X      | 12.1" active matrix | -         | 16-bit stereo sound | \$3599.44 | 94543 |
| 560   | 133MHz Pentium     | 8MB/40MB   | 2.1GB  | -        | 11.3" dual scan     | -         | external floppy     | \$1699.89 | 81184 |
| 560   | 133MHz Pentium     | 8MB/40MB   | 2.1GB  | -        | 12.1" active matrix | -         | external floppy     | \$2849.32 | 81186 |
| 560E  | 150MHz Pentium MMX | 16MB/80MB  | 2.1GB  | -        | 11.3" dual scan     | -         | 16-bit stereo sound | \$2599.86 | 89290 |
| 560E  | 166MHz Pentium MMX | 16MB/80MB  | 2.1GB  | -        | 12.1" active matrix | -         | 16-bit stereo sound | \$4186.26 | 89291 |
| 760XL | 166MHz Pentium MMX | 16MB/104MB | 2.1GB  | optional | 12.1" active matrix | -         | 16-bit stereo sound | \$3769.88 | 84102 |
| 760XD | 166MHz Pentium MMX | 32MB/160MB | 3GB    | 8X       | 12.1" active matrix | 28.8K bps | XGA resolution      | \$4679.37 | 84101 |
| 765L  | 166MHz Pentium MMX | 32MB/104MB | 3GB    | -        | 12.1" active matrix | -         | 16-bit stereo sound | \$5098.39 | 89293 |
| 765D  | 166MHz Pentium MMX | 32MB/104MB | 3GB    | 8X       | 13.3" active matrix | 28.8K bps | Mwave DSP subsystem | \$5499.91 | 89292 |
| 770   | 200MHz Pentium MMX | 32MB/160MB | 3.2GB  | -        | 13.3" active matrix | -         | Lithium ion battery | \$4699.39 | 94545 |
| 770   | 233MHz Pentium MMX | 32MB/160MB | 4GB    | -        | 13.3" active matrix | -         | Lithium ion battery | \$5459.16 | 94544 |
| 770   | 233MHz Pentium MMX | 32MB/160MB | 4GB    | -        | 13.3" active matrix | -         | Windows NT V4.0     | \$5899.36 | 94546 |
| 770   | 233MHz Pentium MMX | 32MB/160MB | 5.1GB  | -        | 14.1" active matrix | 33.6K bps | Lithium ion battery | \$6779.86 | 94547 |

### Toshiba

|                      |                    |            |        |     |                     |           |                          |           |       |
|----------------------|--------------------|------------|--------|-----|---------------------|-----------|--------------------------|-----------|-------|
| Libretto 50CT        | 75MHz Pentium      | 16MB/32MB  | 772MB  | -   | 6.1" active-matrix  | -         | Lithium ion battery      | \$1929.45 | 90350 |
| Satellite 220CDS     | 133MHz Pentium     | 16MB/144MB | 1.34GB | 10X | 12.1" dual scan     | -         | Lithium ion battery      | \$1899.13 | 89777 |
| Satellite Pro 440CDX | 133MHz Pentium MMX | 16MB/144MB | 1.34GB | 10X | 12.1" dual scan     | -         | Lithium ion battery      | \$1989.60 | 90351 |
| Satellite Pro 440CDT | 133MHz Pentium MMX | 16MB/144MB | 1.34GB | 10X | 12.1" active matrix | 33.6K bps | Lithium ion battery      | \$2799.55 | 90352 |
| Satellite Pro 460CDT | 166MHz Pentium MMX | 32MB/160MB | 2.02GB | 10X | 12.1" active matrix | 33.6K bps | Lithium ion battery      | \$5659.16 | 90353 |
| Portege 300CT        | 133MHz Pentium MMX | 32MB/64MB  | 1.5GB  | -   | 10.4" active matrix | 33.6K bps | external floppy          | \$3369.46 | 90354 |
| Portege 660CDT       | 150MHz Pentium     | 16MB/80MB  | 1.2GB  | 10X | 11.3" active matrix | 28.8K bps | external floppy          | \$3189.63 | 77243 |
| Tecra 510CDT         | 133MHz Pentium     | 16MB/144MB | 2.1GB  | 10X | 12.1" active matrix | 28.8K bps | 16-bit stereo sound      | \$2659.76 | 77241 |
| Tecra 520CDT         | 166MHz Pentium MMX | 32MB/160MB | 2GB    | 10X | 12.1" active matrix | 33.6K bps | SVGA resolution          | \$4159.45 | 90355 |
| Tecra 530CDT         | 166MHz Pentium MMX | 32MB/160MB | 2GB    | 10X | 12.1" active matrix | 33.6K bps | XGA resolution           | \$4579.17 | 90359 |
| Tecra 730XCDT        | 150MHz Pentium MMX | 16MB/144MB | 2GB    | 10X | 12.1" active matrix | 28.8K bps | full duplex speakerphone | \$3499.77 | 80957 |
| Tecra 740CDT         | 166MHz Pentium MMX | 16MB/144MB | 3GB    | 10X | 13.3" active matrix | 28.8K bps | video conferencing kit   | \$4849.62 | 87964 |
| Tecra 740CDT         | 166MHz Pentium MMX | 16MB/144MB | 3GB    | 10X | 13.3" active matrix | 28.8K bps | Windows NT V4.0          | \$4999.31 | 87965 |
| Tecra 750CDT         | 233MHz Pentium MMX | 32MB/160MB | 4.7GB  | 20X | 13.3" active matrix | 56.6K bps | 32-bit PCI bus           | \$6449.23 | 96534 |



### IBM

#### IBM® ThinkPad® 180E

- 150MHz Intel Pentium® MMX processor
- 16MB EDO RAM standard, expandable to 80MB
- 2.1GB hard drive
- 12.1" dual-scan SVGA color display
- Pre-loaded Windows® 95

**\$2099.36** CDW 94541



### COMPAQ

#### Armada 1530DM

- 133MHz Intel Pentium® MMX
- 16MB RAM standard, expandable to 80MB • 1.4GB hard drive
- 10X CD-ROM drive
- 12.1" dual-scan color display
- 33.6K bps data/fax modem

**\$1978.67** CDW 91507



### FUJITSU

#### LifeBook 555Tx

- 150MHz Intel Pentium® MMX
- 16MB EDO RAM standard
- 2GB hard drive • 10X CD-ROM drive
- 12.1" SVGA active-matrix color display • Internal 33.6K bps data/fax modem

**\$3199.00** CDW 85008



### Simple Technology

#### 56K Communicator

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- Connects 56K bps and V.34 33.6K bps
- 14.4K bps fax
- MNP10-EC cellular error control technology
- Voice mail/automated paging

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### Robotics

#### XJ1560 56K bps PC Card modem

with XJACK connector

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- Digital Line Guard
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|---------------|--------------------|------------|--------------|------------|----------|------------------------|-------|-----------|-------|
| <b>Acer</b>   |                    |            |              |            |          |                        |       |           |       |
| Network Ready | 200MHz Pentium     | desktop    | 32MB/128MB   | 2.1GB      | optional | 64-bit PCI accelerated | -     | \$896.32  | 91867 |
| Network Ready | 166MHz Pentium MMX | desktop    | 16MB/128MB   | 1GB        | optional | 64-bit PCI accelerated | -     | \$838.11  | 96176 |
| Network Ready | 200MHz Pentium MMX | desktop    | 32MB/128MB   | 2.1GB      | optional | 64-bit PCI accelerated | -     | \$1265.65 | 96178 |
| Business MM   | 166MHz Pentium MMX | desktop    | 16MB/384MB   | 2.1GB      | 20X      | 64-bit PCI accelerated | -     | \$1134.18 | 91883 |
| Business MM   | 200MHz Pentium MMX | desktop    | 32MB/384MB   | 3.2GB      | 20X      | 64-bit PCI accelerated | -     | \$1219.89 | 91884 |
| Business MM   | 200MHz Pentium MMX | mini-tower | 32MB/384MB   | 3.2GB      | 20X      | 64-bit PCI accelerated | -     | \$1589.98 | 91885 |
| Acer Power    | 166MHz Pentium MMX | desktop    | 16MB/384MB   | 2.1GB      | 8X       | 64-bit PCI accelerated | -     | \$1077.36 | 91872 |

|                  |                    |            |            |       |          |                |   |           |       |
|------------------|--------------------|------------|------------|-------|----------|----------------|---|-----------|-------|
| <b>AST Bravo</b> |                    |            |            |       |          |                |   |           |       |
| MS 5166M         | 166MHz Pentium MMX | desktop    | 32MB/256MB | 3GB   | 16X Max  | ATI 3D RAGE II | - | \$1514.69 | 89552 |
| MS 5200/M        | 200MHz Pentium MMX | desktop    | 32MB/256MB | 3GB   | 16X Max  | ATI 3D RAGE II | - | \$1696.69 | 91570 |
| MS 5233/M        | 233MHz Pentium MMX | desktop    | 32MB/256MB | 3GB   | 16X Max  | ATI 3D RAGE II | - | \$1849.48 | 95813 |
| MS 6266          | 266MHz Pentium II  | desktop    | 32MB/256MB | 4.3GB | 16X Max  | ATI 3D RAGE II | - | \$2529.00 | 95817 |
| MS 3000C/95      | 200MHz Pentium MMX | desktop    | 32MB/256MB | 3GB   | 16X Max  | ATI 3D RAGE II | - | \$1696.69 | 91570 |
| LC 5166M         | 166MHz Pentium MMX | desktop    | 16MB/384MB | 2GB   | optional | ATI mach64 VT3 | - | \$1115.18 | 93288 |
| LC 5200M         | 200MHz Pentium MMX | desktop    | 32MB/384MB | 2GB   | optional | ATI mach64 VT3 | - | \$1386.37 | 95811 |
| LC 6233          | 233MHz Pentium II  | mini-tower | 32MB/384MB | 2GB   | optional | S3 VIRGE/DX 3D | - | \$1759.44 | 89108 |
| LC 6233          | 233MHz Pentium II  | mini-tower | 32MB/384MB | 2GB   | optional | S3 VIRGE/DX 3D | - | \$1859.63 | 89107 |

|                            |                    |            |            |       |          |                |   |           |       |
|----------------------------|--------------------|------------|------------|-------|----------|----------------|---|-----------|-------|
| <b>Compaq Deskpro 2000</b> |                    |            |            |       |          |                |   |           |       |
| 5166X/2100                 | 166MHz Pentium MMX | desktop    | 16MB/384MB | 2.1GB | optional | S3 Trio64V2/GX | - | \$1169.00 | 92269 |
| 5166X/3200                 | 166MHz Pentium MMX | desktop    | 16MB/384MB | 3.2GB | optional | S3 Trio64V2/GX | - | \$1219.00 | 92838 |
| 5166X/3200                 | 166MHz Pentium MMX | mini-tower | 16MB/384MB | 3.2GB | 16X Max  | S3 Trio64V2/GX | - | \$1529.00 | 92839 |
| 5200X/2100                 | 200MHz Pentium MMX | desktop    | 16MB/384MB | 2.1GB | optional | S3 Trio64V2/GX | - | \$1319.00 | 92840 |
| 5200X/3200/CDS             | 200MHz Pentium MMX | mini-tower | 32MB/384MB | 3.2GB | 16X Max  | S3 Trio64V2/GX | - | \$1679.00 | 92842 |
| 5200X/3200                 | 200MHz Pentium MMX | desktop    | 32MB/384MB | 3.2GB | optional | S3 Trio64V2/GX | - | \$1489.00 | 92841 |
| 5233X/3200/CDS             | 233MHz Pentium MMX | desktop    | 32MB/384MB | 3.2GB | 16X Max  | S3 Trio64V2/GX | - | \$1859.00 | 92843 |
| 6233X/2100                 | 233MHz Pentium II  | desktop    | 32MB/384MB | 2.1GB | optional | Matrox 1064-SG | - | CALL!     | 95916 |
| 6233X/3200/CDS             | 233MHz Pentium II  | desktop    | 32MB/384MB | 3.2GB | 24X Max  | Matrox 1064-SG | - | CALL!     | 95917 |
| 6266X/3200/CDS             | 266MHz Pentium II  | desktop    | 32MB/384MB | 3.2GB | 24X Max  | Matrox 1064-SG | - | CALL!     | 95918 |
| 6266X/3200/CDS             | 266MHz Pentium II  | mini-tower | 32MB/384MB | 3.2GB | 24X Max  | Matrox 1064-SG | - | CALL!     | 95919 |
| 6300X/3200/CDS             | 300MHz Pentium II  | mini-tower | 32MB/384MB | 3.2GB | 24X Max  | Matrox 1064-SG | - | CALL!     | 95920 |

|                            |                    |            |            |       |          |                |   |           |       |
|----------------------------|--------------------|------------|------------|-------|----------|----------------|---|-----------|-------|
| <b>Compaq Deskpro 4000</b> |                    |            |            |       |          |                |   |           |       |
| 5166X/2400                 | 166MHz Pentium MMX | desktop    | 16MB/256MB | 2.4GB | optional | S3 VIRGE/GX    | - | \$1389.00 | 92844 |
| 5166X/3200                 | 166MHz Pentium MMX | desktop    | 32MB/256MB | 3.2GB | optional | S3 VIRGE/GX    | - | \$1599.00 | 92845 |
| 5166X/3200/CDS             | 166MHz Pentium MMX | mini-tower | 32MB/256MB | 3.2GB | 16X Max  | S3 VIRGE/GX    | - | \$1799.00 | 92846 |
| 5200X/2400                 | 200MHz Pentium MMX | desktop    | 32MB/256MB | 2.4GB | optional | S3 VIRGE/GX    | - | \$1689.00 | 92847 |
| 5200X/3200                 | 200MHz Pentium MMX | desktop    | 32MB/256MB | 3.2GB | optional | S3 VIRGE/GX    | - | \$1759.00 | 92848 |
| 5233X/3200X/CDS            | 233MHz Pentium MMX | mini-tower | 32MB/256MB | 3.2GB | 16X Max  | S3 VIRGE/GX    | - | \$2129.00 | 92849 |
| 6233X/2400X                | 233MHz Pentium II  | mini-tower | 32MB/256MB | 2.4GB | optional | Matrox 1064-SG | - | CALL!     | 95921 |
| 6233X/3200X                | 233MHz Pentium II  | mini-tower | 32MB/256MB | 3.2GB | 24X Max  | Matrox 1064-SG | - | CALL!     | 95922 |
| 6266X/3200X                | 266MHz Pentium II  | mini-tower | 32MB/256MB | 3.2GB | 24X Max  | Matrox 1064-SG | - | CALL!     | 95924 |
| 6233X/3200X                | 233MHz Pentium II  | mini-tower | 32MB/256MB | 3.2GB | 24X Max  | Matrox 1064-SG | - | CALL!     | 95923 |
| 6266X/3200X                | 266MHz Pentium II  | mini-tower | 32MB/256MB | 3.2GB | 24X Max  | Matrox 1064-SG | - | CALL!     | 95925 |

|                            |                   |            |      |       |         |                      |   |       |       |
|----------------------------|-------------------|------------|------|-------|---------|----------------------|---|-------|-------|
| <b>Compaq Deskpro 6000</b> |                   |            |      |       |         |                      |   |       |       |
| 6233X/2100/CDS             | 233MHz Pentium II | desktop    | 32MB | 2.1GB | 24X Max | Matrox Millennium II | - | CALL! | 95929 |
| 6266X/2100/CDS             | 266MHz Pentium II | desktop    | 32MB | 2.1GB | 24X Max | Matrox Millennium II | - | CALL! | 95930 |
| 6266X/4300/CDS             | 266MHz Pentium II | desktop    | 32MB | 4.3GB | 24X Max | Matrox Millennium II | - | CALL! | 95931 |
| 6300X/4300/CDS             | 300MHz Pentium II | desktop    | 64MB | 4.3GB | 24X Max | Matrox Millennium II | - | CALL! | 95933 |
| 6266X/4300/CDS             | 266MHz Pentium II | mini-tower | 64MB | 4.3GB | 24X Max | Matrox Millennium II | - | CALL! | 95932 |
| 6300X/4300/CDS             | 300MHz Pentium II | mini-tower | 64MB | 4.3GB | 24X Max | Matrox Millennium II | - | CALL! | 95934 |



**APC**

**Back-UPS Pro Plug and Play**

- Automatic Voltage Regulation (AVR)
- Modem/10BASE-T surge suppression
- Surge and noise suppression
- PowerChute Pro for Windows 95 software

**428PNP \$238.64** CDW 56625

**650PNP \$296.87** CDW 56626



**PowerQuest**

**Drive Image**

For Windows 95 and DOS V5.0 or above

- Creates compressed image files of an individual partition or an entire hard drive
- Allows for quick back-up, disaster recovery or upgrading to a new, larger-capacity hard drive

**\$58.49** CDW 93968

\*After \$1.50 mail-in rebate. Offer valid through 2/31/97



**Adobe**

**PhotoDeluxe V2.0**

For Windows 95

NEW features include:

- Direct links to on-line processing from Fuji, Kodak Picture Network, Picta and PhotoNet/Adobe
- Advanced technologies for the removal of unwanted elements, foolproof cutting and tracing and one-step red-eye removal

**\$47.67** CDW 95420



**Microtek**

**ScanMaker V300**

- Resolution: 300 x 600 dpi optical, 4800 dpi interpolated
- 24-bit color, 8-bit grayscale or 1-bit monochrome scanning
- 8.5" x 13.5" max. scanning area
- Enhanced Parallel Port with 25/25 pin parallel pass-through cable interface

**\$145.33** CDW 96075



**EPSON**

**Stylus Color 600**

- 4-color (CMYK) drop-on demand MicroPiezo ink jet print technology
- 1440 x 720 dpi photo quality color and laser quality black text on premium paper
- 720 x 720 dpi photo quality color and laser quality black text on plain paper
- Print speeds: up to 6 ppm black; up to 4 ppm color
- 2-year limited warranty

**\$299.00** CDW 80668

|                                                                                                                                                                                                                                                                                                                                                                                                   |  |  |  |  |  |  |  |  |  |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|--|--|--|--|--|--|--|
|                                                                                                                                                                                                                                                                                                                                                                                                   |  |  |  |  |  |  |  |  |  |
| <b>APC</b>                                                                                                                                                                                                                                                                                                                                                                                        |  |  |  |  |  |  |  |  |  |
| <b>Back-UPS Pro Plug and Play</b>                                                                                                                                                                                                                                                                                                                                                                 |  |  |  |  |  |  |  |  |  |
| <ul style="list-style-type: none"> <li>Automatic Voltage Regulation (AVR)</li> <li>Modem/10BASE-T surge suppression</li> <li>Surge and noise suppression</li> <li>PowerChute Pro for Windows 95 software</li> </ul>                                                                                                                                                                               |  |  |  |  |  |  |  |  |  |
| <b>428PNP \$238.64</b> CDW 56625                                                                                                                                                                                                                                                                                                                                                                  |  |  |  |  |  |  |  |  |  |
| <b>650PNP \$296.87</b> CDW 56626                                                                                                                                                                                                                                                                                                                                                                  |  |  |  |  |  |  |  |  |  |
|                                                                                                                                                                                                                                                                                                                                                                                                   |  |  |  |  |  |  |  |  |  |
| <b>PowerQuest</b>                                                                                                                                                                                                                                                                                                                                                                                 |  |  |  |  |  |  |  |  |  |
| <b>Drive Image</b>                                                                                                                                                                                                                                                                                                                                                                                |  |  |  |  |  |  |  |  |  |
| For Windows 95 and DOS V5.0 or above                                                                                                                                                                                                                                                                                                                                                              |  |  |  |  |  |  |  |  |  |
| <ul style="list-style-type: none"> <li>Creates compressed image files of an individual partition or an entire hard drive</li> <li>Allows for quick back-up, disaster recovery or upgrading to a new, larger-capacity hard drive</li> </ul>                                                                                                                                                        |  |  |  |  |  |  |  |  |  |
| <b>\$58.49</b> CDW 93968                                                                                                                                                                                                                                                                                                                                                                          |  |  |  |  |  |  |  |  |  |
| <small>*After \$1.50 mail-in rebate. Offer valid through 2/31/97</small>                                                                                                                                                                                                                                                                                                                          |  |  |  |  |  |  |  |  |  |
|                                                                                                                                                                                                                                                                                                                                                                                                   |  |  |  |  |  |  |  |  |  |
| <b>Adobe</b>                                                                                                                                                                                                                                                                                                                                                                                      |  |  |  |  |  |  |  |  |  |
| <b>PhotoDeluxe V2.0</b>                                                                                                                                                                                                                                                                                                                                                                           |  |  |  |  |  |  |  |  |  |
| For Windows 95                                                                                                                                                                                                                                                                                                                                                                                    |  |  |  |  |  |  |  |  |  |
| NEW features include:                                                                                                                                                                                                                                                                                                                                                                             |  |  |  |  |  |  |  |  |  |
| <ul style="list-style-type: none"> <li>Direct links to on-line processing from Fuji, Kodak Picture Network, Picta and PhotoNet/Adobe</li> <li>Advanced technologies for the removal of unwanted elements, foolproof cutting and tracing and one-step red-eye removal</li> </ul>                                                                                                                   |  |  |  |  |  |  |  |  |  |
| <b>\$47.67</b> CDW 95420                                                                                                                                                                                                                                                                                                                                                                          |  |  |  |  |  |  |  |  |  |
|                                                                                                                                                                                                                                                                                                                                                                                                   |  |  |  |  |  |  |  |  |  |
| <b>Microtek</b>                                                                                                                                                                                                                                                                                                                                                                                   |  |  |  |  |  |  |  |  |  |
| <b>ScanMaker V300</b>                                                                                                                                                                                                                                                                                                                                                                             |  |  |  |  |  |  |  |  |  |
| <ul style="list-style-type: none"> <li>Resolution: 300 x 600 dpi optical, 4800 dpi interpolated</li> <li>24-bit color, 8-bit grayscale or 1-bit monochrome scanning</li> <li>8.5" x 13.5" max. scanning area</li> <li>Enhanced Parallel Port with 25/25 pin parallel pass-through cable interface</li> </ul>                                                                                      |  |  |  |  |  |  |  |  |  |
| <b>\$145.33</b> CDW 96075                                                                                                                                                                                                                                                                                                                                                                         |  |  |  |  |  |  |  |  |  |
|                                                                                                                                                                                                                                                                                                                                                                                                   |  |  |  |  |  |  |  |  |  |
| <b>EPSON</b>                                                                                                                                                                                                                                                                                                                                                                                      |  |  |  |  |  |  |  |  |  |
| <b>Stylus Color 600</b>                                                                                                                                                                                                                                                                                                                                                                           |  |  |  |  |  |  |  |  |  |
| <ul style="list-style-type: none"> <li>4-color (CMYK) drop-on demand MicroPiezo ink jet print technology</li> <li>1440 x 720 dpi photo quality color and laser quality black text on premium paper</li> <li>720 x 720 dpi photo quality color and laser quality black text on plain paper</li> <li>Print speeds: up to 6 ppm black; up to 4 ppm color</li> <li>2-year limited warranty</li> </ul> |  |  |  |  |  |  |  |  |  |
| <b>\$299.00</b> CDW 80668                                                                                                                                                                                                                                                                                                                                                                         |  |  |  |  |  |  |  |  |  |



# of savings and selection.

## Desktops

| Model                  | Processor                     | Chassis    | RAM std./max | Hard drive | CD-ROM  | Video                     | Modem     | Price     | CDW   |
|------------------------|-------------------------------|------------|--------------|------------|---------|---------------------------|-----------|-----------|-------|
| <b>Compaq Presario</b> |                               |            |              |            |         |                           |           |           |       |
| 2200                   | 180MHz processor with MediaGX | desktop    | 16MB/64MB    | 1.6GB      | 8X      | MPEG full-motion playback | 33.6K bps | \$799.00  | 92852 |
| 4505                   | 166MHz Pentium MMX            | mini-tower | 16MB/64MB    | 2.1GB      | 16X Max | 64-bit PCI accelerated    | 33.6K bps | \$899.00  | 95066 |
| 4508                   | 200MHz Pentium MMX            | mini-tower | 24MB/64MB    | 3.2GB      | 16X Max | 64-bit PCI accelerated    | 33.6K bps | \$1499.00 | 90510 |
| 4528                   | 233MHz Pentium MMX            | mini-tower | 32MB/64MB    | 3.2GB      | 24X Max | 64-bit PCI accelerated    | 33.6K bps | \$1799.00 | 90511 |
| 4814                   | 233MHz Pentium II             | mini-tower | 32MB/256MB   | 6.5GB      | 24X Max | 64-bit PCI accelerated    | 56K bps   | \$1999.00 | 90512 |

### HP Brio Series

|      |                    |            |            |       |          |                   |         |           |       |
|------|--------------------|------------|------------|-------|----------|-------------------|---------|-----------|-------|
| 8012 | 166MHz Pentium MMX | mini-tower | 16MB/128MB | 2.1GB | optional | S3 Trio 64V2      | -       | \$899.93  | 95050 |
| 8014 | 200MHz Pentium MMX | mini-tower | 16MB/128MB | 2.1GB | optional | S3 Trio 64V2      | -       | \$1154.35 | 95052 |
| 8017 | 233MHz Pentium MMX | mini-tower | 32MB/128MB | 3.2GB | optional | S3 Trio 64V2      | -       | \$1449.95 | 95053 |
| 8032 | 166MHz Pentium MMX | mini-tower | 16MB/128MB | 2.1GB | 16X Max  | S3 Trio 64V2      | -       | \$1149.54 | 95054 |
| 8034 | 200MHz Pentium MMX | mini-tower | 32MB/128MB | 2.1GB | 16X Max  | S3 Trio 64V2      | -       | \$1419.35 | 95055 |
| 8037 | 233MHz Pentium MMX | mini-tower | 32MB/128MB | 3.2GB | 24X Max  | S3 Trio 64V2      | -       | \$1649.54 | 95056 |
| 8172 | 166MHz Pentium MMX | mini-tower | 16MB/128MB | 2.1GB | 16X Max  | S3 Trio 64V2      | 56K bps | \$1379.29 | 95057 |
| 8175 | 200MHz Pentium MMX | mini-tower | 32MB/192MB | 2.1GB | 24X Max  | S3 Trio 64V2      | 56K bps | \$1749.63 | 95059 |
| 8178 | 233MHz Pentium MMX | mini-tower | 32MB/192MB | 6GB   | 24X Max  | Matrox Millennium | 56K bps | \$2117.37 | 95061 |

### HP Vectra VE Series 3 PC

|            |                    |         |            |       |          |          |   |           |       |
|------------|--------------------|---------|------------|-------|----------|----------|---|-----------|-------|
| VE3 5/200  | 200MHz Pentium     | desktop | 16MB/192MB | 1GB   | optional | SiS 6205 | - | \$1047.24 | 96382 |
| VE3 5/166M | 166MHz Pentium MMX | desktop | 16MB/192MB | 1.6GB | optional | SiS 6205 | - | \$1164.09 | 96383 |
| VE3 5/200M | 200MHz Pentium MMX | desktop | 16MB/192MB | 1.6GB | optional | SiS 6205 | - | \$1236.55 | 96384 |
| VE3 5/166M | 166MHz Pentium MMX | desktop | 16MB/192MB | 1.6GB | 24X      | SiS 6205 | - | \$1345.25 | 96389 |

### HP Vectra VL Series 5 PC

|            |                    |            |            |       |     |                  |   |           |       |
|------------|--------------------|------------|------------|-------|-----|------------------|---|-----------|-------|
| VL5 5/166M | 166MHz Pentium MMX | desktop    | 32MB/192MB | 2.5GB | -   | 2MB S3 Trio64 V2 | - | \$1459.70 | 95736 |
| VL5 5/200M | 200MHz Pentium MMX | desktop    | 32MB/192MB | 2.5GB | 24X | 2MB S3 Trio64 V2 | - | \$1678.26 | 95732 |
| VL5 5/166M | 166MHz Pentium MMX | mini-tower | 16MB/192MB | 2.5GB | 24X | 2MB S3 Trio64 V2 | - | \$1489.15 | 95731 |
| VL5 5/200M | 200MHz Pentium MMX | mini-tower | 32MB/192MB | 2.5GB | 24X | 2MB S3 Trio64 V2 | - | \$1739.59 | 95733 |
| VL5 5/233M | 233MHz Pentium MMX | mini-tower | 32MB/192MB | 4GB   | 24X | 2MB S3 Trio64 V2 | - | \$1967.75 | 95734 |

### IBM Aptiva

|     |                    |            |           |       |         |                |           |           |       |
|-----|--------------------|------------|-----------|-------|---------|----------------|-----------|-----------|-------|
| C3D | 233MHz Pentium MMX | mini-tower | 32MB/64MB | 4.2GB | 8X DVD  | ATI 3D RAGE II | 33.6K bps | \$2499.27 | 90535 |
| S3C | 233MHz Pentium MMX | mini-tower | 32MB/64MB | 4.2GB | 16X Max | ATI 3D RAGE II | 33.6K bps | \$2159.29 | 90537 |
| S35 | 233MHz Pentium MMX | mini-tower | 48MB/64MB | 6.4GB | 24X Max | ATI 3D RAGE II | 33.6K bps | \$2499.27 | 90538 |

### IBM PC Series

|          |                    |            |            |       |          |                   |   |           |       |
|----------|--------------------|------------|------------|-------|----------|-------------------|---|-----------|-------|
| PC 300GL | 166MHz Pentium MMX | desktop    | 32MB/128MB | 2.5GB | optional | Cirrus Logic 5446 | - | \$1289.32 | 94858 |
| PC 300GL | 200MHz Pentium MMX | desktop    | 32MB/128MB | 2.5GB | 16X Max  | Cirrus Logic 5446 | - | \$1579.18 | 89296 |
| PC 300GL | 200MHz Pentium MMX | desktop    | 32MB/128MB | 2.5GB | optional | Cirrus Logic 5446 | - | \$1449.74 | 95162 |
| PC 300PL | 166MHz Pentium MMX | desktop    | 32MB/384MB | 2.5GB | optional | Matrox Mystique   | - | \$1575.34 | 94012 |
| PC 300PL | 233MHz Pentium MMX | desktop    | 32MB/384MB | 4.2GB | 24X Max  | Matrox Mystique   | - | \$2045.54 | 95759 |
| PC 300PL | 200MHz Pentium MMX | desktop    | 32MB/384MB | 4.2GB | 24X Max  | Matrox Mystique   | - | \$1839.20 | 94014 |
| PC 300PL | 233MHz Pentium MMX | mini-tower | 32MB/384MB | 4.3GB | 24X Max  | Matrox Mystique   | - | \$2449.56 | 95764 |
| PC 300XL | 233MHz Pentium II  | desktop    | 32MB/384MB | 2.5GB | 16X Max  | S3 Trio64V2       | - | \$2259.14 | 86313 |
| PC 300XL | 233MHz Pentium II  | desktop    | 32MB/384MB | 2.5GB | optional | S3 Trio64V2       | - | \$1975.36 | 86314 |
| PC 300XL | 266MHz Pentium II  | desktop    | 32MB/384MB | 4.2GB | 16X Max  | S3 Trio64V2       | - | \$2659.12 | 86315 |

### Toshiba

|              |                    |            |            |        |         |                     |         |           |       |
|--------------|--------------------|------------|------------|--------|---------|---------------------|---------|-----------|-------|
| Equium 5200D | 200MHz Pentium MMX | desktop    | 32MB/192MB | 2.38GB | 12X     | 2MB ATI 3D RAGE II  | -       | \$1549.64 | 84249 |
| Equium 6200D | 200MHz Pentium Pro | desktop    | 32MB/128MB | 2.95GB | 12X     | 2MB S3 VIRGE 3D     | -       | \$2118.60 | 84251 |
| Equium 6200M | 200MHz Pentium Pro | mini-tower | 32MB/512MB | 4.24GB | 12X     | 2MB ATI 3D RAGE II+ | -       | \$2479.47 | 84252 |
| Equium 5230D | 233MHz Pentium MMX | desktop    | 32MB/192MB | 3GB    | 24X Max | 2MB ATI 3D RAGE II+ | -       | \$1798.36 | 95209 |
| Equium 6230D | 233MHz Pentium II  | desktop    | 32MB/192MB | 3GB    | 24X Max | 2MB ATI 3D RAGE II+ | -       | \$2199.43 | 95208 |
| Equium 6260M | 266MHz Pentium II  | mini-tower | 32MB/256MB | 3.73GB | 16X     | 4MB ATI 3D RAGE II+ | -       | \$2569.07 | 93106 |
| Infinia 7230 | 233MHz Pentium MMX | mini-tower | 64MB/128MB | 6.4GB  | 24X     | 2MB ATI RAGE II     | 56K bps | \$1979.74 | 96270 |
| Infinia 7231 | 233MHz Pentium MMX | mini-tower | 64MB/128MB | 4GB    | DVD     | 2MB ATI RAGE II     | 56K bps | \$2495.50 | 96269 |
| Infinia 7260 | 266MHz Pentium II  | mini-tower | 64MB/128MB | 6.4GB  | 24X     | 2MB ATI RAGE II     | 56K bps | \$2599.47 | 96582 |

**New!**



#### Logitech

##### PageScan Color Parallel for Windows 95

- Up to 400 dpi optical resolution; enhanced resolutions up to 2400 dpi
- 10-page automatic document feeder makes scanning multi-page originals a snap

**\$215.50** CDW 94735



#### UMAX

##### Astra 600S

- Single-pass
- Resolution: 300 x 600 dpi optical, 4800 dpi interpolated
- Scan speed: 3ms/line grayscale, 9ms/line color
- Maximum scan area: 8.5" x 14"
- Scanning modes: 30-bit color, 10-bit grayscale

**\$169.74** CDW 85439



#### MAG Innovation

##### DJ510

- 15" color monitor
- 15" anti-static, anti-glare CRT, 13.9" viewable image size
- 0.28mm dot pitch
- Maximum resolution: 1280 x 1024 at 65Hz
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#### Microsoft

##### Encarta Reference Suite 98

For Windows 95 and NT

- Includes three popular reference products: Encarta 98 Deluxe Edition, Encarta Virtual Globe 1998 Edition and Bookshelf 98.

CD **\$99.95** CDW 93129



#### Imaging

##### Ditto Max

- Up to 7GB capacity with compression
- Backup rate: Up to 36MB per minute with a 4MB per second Ditto Dash accelerator (internal model only)
- Backward compatible with earlier Ditto TR3 and 2GB cartridges

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External **\$199.95** CDW 95705

3GB tape **\$19.95** CDW 95708

5GB tape **\$25.95** CDW 95710

7GB tape **\$29.95** CDW 95712



#### 3COM

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- Parallel Tasking PACE Interactive Access technology for unsurpassed throughput and low CPU utilization
- Dynamic Access features—including PACE Interactive technology, PACE real-time applications support, free PictureTel™ data conferencing software



## Whether you need *an ink jet's color, a laser's speed, or another unit's multifunctionality, one of these printers is right for you.*

*By Bruce Brown, Alfred Poor, and Winn L. Rosch*

**P**lanning on buying a new printer? Then you have quite a task in front of you. The shelves of computer stores and ads for mail-order houses are crammed with offerings, each one claiming better, faster output for less money. The choices are more varied than ever. And the choices are also better than ever.

If you are in the market for a printer for personal use in the office or home, your choices are among

- color ink jet printers, some that cost as little as \$150, and others that can deliver near photo-quality output;
- monochrome laser printers, some priced at less than \$300, and one at an incredible \$200;
- multifunction printers (MFPs) that combine printing and (typically) faxing, scanning, and copying, priced at \$450 to \$1,000.

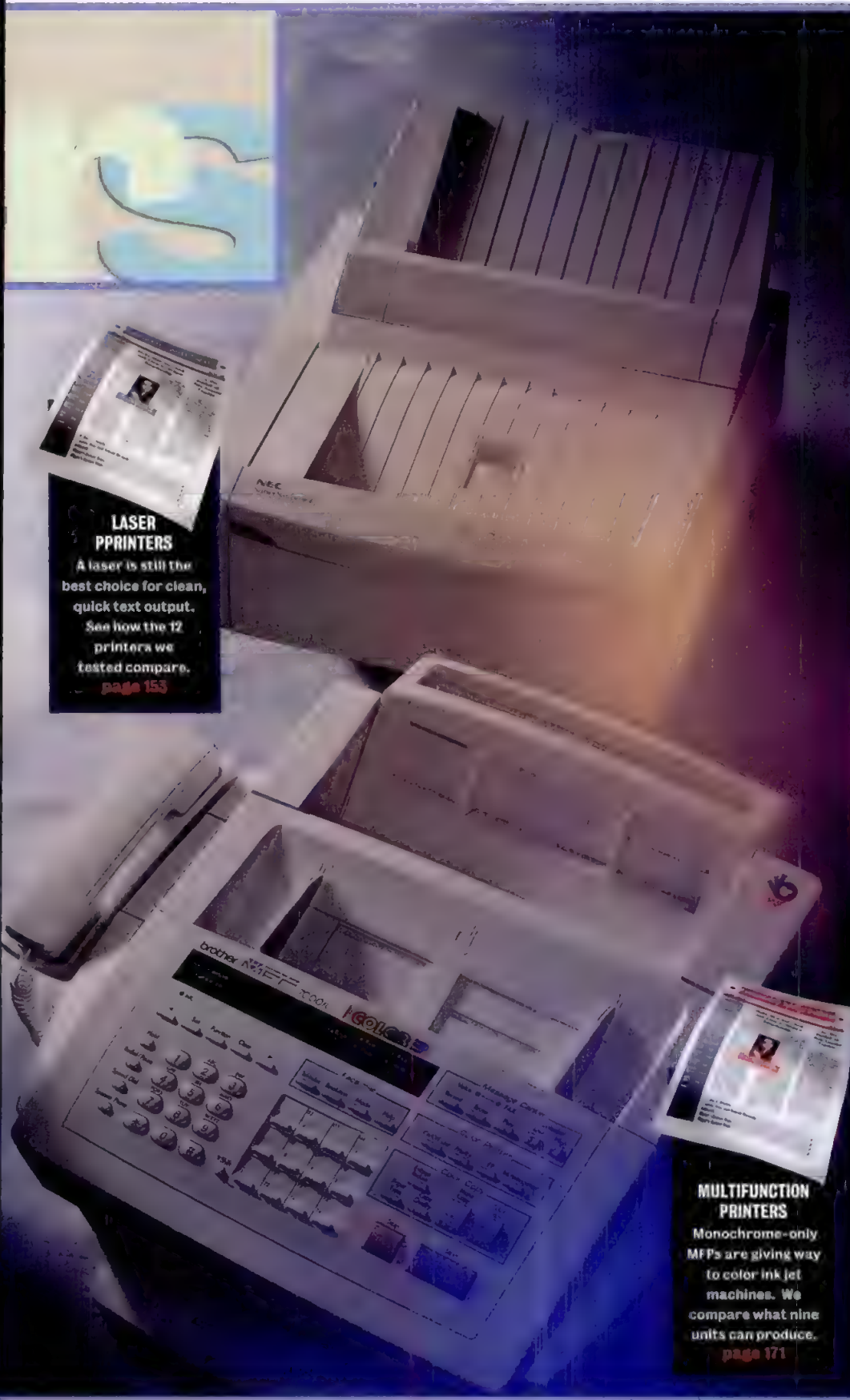
Traditionally, home users lean toward color ink jet printers, which let them produce greeting cards, banners, T-shirt transfers,

[www.pcmag.com](http://www.pcmag.com)  
How does **your printer** stack up against the **new generation** of ink jets and lasers? Download the sample files from the **interactive version** of "Personal Printers" and compare.

### COLOR INK JET PRINTERS

Ink jet output is better than ever, with some printers simulating actual photos. Compare our 25 tested units.

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### LASER PPRINTERS

A laser is still the best choice for clean, quick text output. See how the 12 printers we tested compare.

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### MULTIFUNCTION PRINTERS

Monochrome-only MFPs are giving way to color ink jet machines. We compare what nine units can produce.

page 171



## Editors' Choice

- Business ink jet: Epson Stylus Color 800
- Home ink jet: HP DeskJet 722C
- Personal laser: NEC SuperScript 860
- Multifunction: Brother MFC-7000FC



*Among ink jet printers, there are few bad choices. For business users, the best choice is the Epson Stylus Color 800 (\$400 street). Epson combines speed, excellent*

color output, and optional network connectivity. For those who need a more home-oriented printer for photos, family projects, and the occasional work-related project, our Editors' Choice is the HP DeskJet 722C (\$300 street). The 722C features several new technologies for enhancing graphics output. The result is stunning images.

Five other ink jets deserve honorable mention. The Canon BJC-80 (\$300 street) is a 4-pound portable powerhouse that delivers excellent output at reasonable speeds. The Epson Stylus Color 1520 (\$800 street) and the HP DeskJet 1000CSe (\$500 street) and DeskJet 1600CM (\$2,000 street) go in the other direction: These business workhorses offer tabloid-size color output for oversize spreadsheets, DTP, layouts, and the like. For home users or students on a budget, the ultra-affordable Epson Stylus Color 400 (\$200 street) delivered very good four-color output and decent speed for the price.

### PERSONAL LASERS

The price/performance leader and Editors' Choice among these fine entries is the NEC SuperScript 860 (\$400 street). It was the fastest printer overall on our tests, thanks to its 8-ppm engine and PrintGear printing-system architecture, which renders pages quickly.

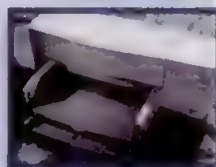
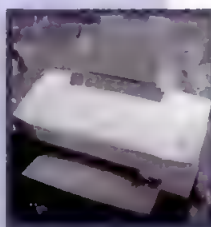
Three laser printers merit honorable mention. The 6-ppm HP LaserJet 6Lse (\$400 street), the 8-ppm HP LaserJet 6Pse (\$800 street), and the NEC Super-

Script 660plus (\$300 street), the follow-up to last year's laser Editors' Choice, all offer good output and solid feature sets.

### MULTIFUNCTION PRINTERS

For those who have decided on a personal MFP, our Editors' Choice is the Brother MFC-7000FC (\$1,000 street). It isn't the least expensive color printer/scanner/copier on the market, but it performs each of those tasks (plus faxing) better than its competitors. Honorable mention goes to the HP OfficeJet 1150Cse (\$900 street), whose flatbed scanner and great printed output make it a worthy choice if you don't need faxing.

Users looking for a \$500 solution should consider our second honorable mention, the Document HomeCentre (\$500 street) from Xerox. It incorporates a detachable 400-dpi scanner, making it a soup-to-nuts solution for buyers getting started in digital imaging. If you don't need color input or output, consider our final honorable mention, the Brother MFC-4550 (\$700 street). Quick laser output and 300-dpi monochrome scanning and copying make it a handy small-office appliance.



and other colorful "family fun" projects. Corporate and small-business users, meanwhile, are more inclined toward laser printers for their better text output, greater speed, and lower overall operating costs.

MFPs started out as more of a space- and cost-saving novelty for those setting up a home office. But as they become more functional—offering high-resolution color printing, color scanning, and color copying instead of low-resolution monochrome (black-and-white) input and output—expect to see personal MFPs cropping up in both home and corporate settings.

In fact, MFPs, which now account for just 5 percent of total personal printers sold, should command at least 10 percent of a much larger printer market by 2001. That's according to Lyra Research, a Newtonville, Mass.-based research house specializing in the hard-copy marketplace. Ink jet sales should continue to explode as well, with units shipped worldwide going from almost 24 million this year (79 percent of total printer sales) to more than 46 million units (84 percent) in 2001. These increases come partly at the expense of personal lasers, whose volume is expected to slip from 4.6 million (16 percent) this year to just 3.4 million (6 percent) after the turn of the decade.

### REVIEW CRITERIA

For this roundup, we tested all personal laser printers (which we define as those with a rated engine speed of 10 ppm or less) and ink jet printers new to the market since our printer issue a year ago (November 5, 1996). For the MFP portion of the story, we invited the top vendors in the category to submit their printer-based (as opposed to fax-based) MFPs priced at \$1,000 or less on the street.

We tested 25 ink jets, 12 lasers, and 9 MFPs. Two of those MFPs (the Brother MFC-4550 and Panasonic KX-PS600) are based on a monochrome laser printer engine, while the others use color ink jet engines. New laser printers from Apple and Kyocera would have met our filter criteria but were not ready in time for testing. Similarly, two ink jet printers from NEC and an MFP from Sharp were not yet ready for this story.



## Personal Printers: Finding the Products That Fit

To narrow the field of 46 reviewed products to the few that are right for you, simply find the user category that best describes you (left column) and the type of printing you do (top row). The units at the intersection are your best choices. Note that we recommend some of the printers over others, so consult the reviews for detailed evaluations.

|                      | Text, simple black-and-white graphics                                                                                                                                                                                     | Text, color graphics                                                                                                                                                                                                                                                                                              | Photos, family and business projects                                                                                                                                                                                                                    |
|----------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Home, student</b> | <b>Laser:</b> Brother HL-730 Plus, HL-760 Plus, HP LaserJet 6Lse, Minolta PageWorks 6L, Mita DP-560, NEC Superscript 660plus                                                                                              | <b>Ink jet:</b> Canon BJC 250, HP DeskJet 400L, Lexmark Color JetPrinter 1000<br><br><b>Multifunction:</b> Xerox Document HomeCentre                                                                                                                                                                              | <b>Ink jet:</b> Alps MD-1000, Canon BJC-4304 Photo, Epson Stylus Color 600, Stylus Photo, HP DeskJet 672C, 694C, 722C, Photosmart, Lexmark Color Jetprinter 2030, 3000<br><br><b>Multifunction:</b> Xerox Document HomeCentre                           |
| <b>SOHO</b>          | <b>Laser:</b> Brother HL-760 Plus, HP LaserJet 6Lse, 6Pse, Lexmark Optra E+, Minolta PageWorks 6L, 6e, NEC SuperScript 660plus, 860, Okidata OkiPage 6e<br><br><b>Multifunction:</b> Brother MFC-4550, Panasonic KX-PS600 | <b>Ink jet:</b> Apple Color StyleWriter 6500, Canon BJC-80, BJC-620, BJC-7000, Epson Stylus Color 800, HP DeskJet 672C, 694C, 722C, Lexmark Color JetPrinter 2030, 3000<br><br><b>Multifunction:</b> Brother MFC-7000FC, Canon MultiPass C3000, HP OfficeJet 570, 630, Pro 1150Cse, Xerox Document WorkCentre 450 | <b>Ink jet:</b> Canon BJC-4304 Photo, Epson Stylus Color 600, 800, Stylus Photo, HP DeskJet 722C, 890C, Photosmart, Lexmark Color Jetprinter 3000, 7000<br><br><b>Multifunction:</b> Canon MultiPass C3000, HP OfficeJet 630, Xerox Document HomeCentre |
| <b>Business</b>      | <b>Laser:</b> Brother HL-1060, HP LaserJet 6Pse, Lexmark Optra E+, NEC SuperScript 860<br><br><b>Multifunction:</b> Brother MFC-4550, Panasonic KX-PS600                                                                  | <b>Ink jet:</b> Apple Color StyleWriter 6500, Canon BJC-80, BJC-620, BJC-7000, Epson Stylus Color 800, 1520, HP DeskJet 890C, 1000Cse, 1600CM, Lexmark Color JetPrinter 7000<br><br><b>Multifunction:</b> Brother MFC-7000FC, HP OfficeJet Pro 1150Cse                                                            | <b>Ink jet:</b> Canon BJC-4304 Photo, Epson Stylus Color 800, 1520, Stylus Photo, HP DeskJet 890C, 1000Cse, Photosmart, Lexmark Color Jetprinter 7000<br><br><b>Multifunction:</b> Brother MFC-7000FC, HP OfficeJet Pro 1150C                           |

### INK JET OR LASER: WHICH TO CHOOSE?

In order to decide which printing technology—laser or ink jet—suits your needs the best, you have to understand the features and limitations of both designs.

Lasers work by a process similar to that of a typical photocopier. Light from a laser draws an image on a photosensitive drum, which takes on an electrical charge where the laser hits. Plastic toner particles stick to the charged areas and are then transferred to the sheet of paper. The paper passes through a *fuser*, where heat and pressure melt the toner onto the surface of the paper. The whole process is simple, fast, and efficient.

Ink jet printers aren't all that complicated, either. Though different manufacturers have different ways to control the process, ink jets work by spraying tiny drops of ink onto paper. The shape of the ink nozzles, the size and number of drops, and the way the ink is heated vary, but the printing technology is similar among vendors. The earliest ink jets often produced fuzzy text unless printed on special coated paper, and the ink smeared easily no matter which type of paper you used. Today's models use special inks that have pretty much solved those problems.

### IT ALL ADDS UP

The design differences between lasers and ink jets have an important effect on cost.

Most users focus on purchase price when comparison shopping, but you need to keep in mind costs over the life of the printer. A laser printer will cost you about 2 to 3 cents per page for a typical business letter (estimated at about 5 percent toner coverage) for all consumables: toner, developer, and drum. The same page on an ink jet averages 4 cents. So for every 500-sheet ream of paper, that 1-penny difference per page means a \$5 total cost difference. It is worth noting that the more expensive ink jets tend to have larger ink tanks, which helps lower per-page costs.

Color printing is clearly more expensive than black printing, mainly because you tend to cover more of the page when printing with color ink. For 15 percent page coverage (a typical business report with a color pie or bar chart), the reviewed ink jet printers have per-page costs ranging from 6 to 23 cents. Printing photographic images is even more expensive because the printed area sometimes has 100 percent coverage; ink cost estimates for full-page photo printing range from \$1 to \$2.

Keep in mind that some ink jets have one cartridge for all three color inks (cyan, magenta, and yellow). When you use up one color, you have to toss the entire cartridge, which pushes up the cost of consumables beyond the vendor's estimates. Three of the ink jet printers and three of the ink jet MFPs in this roundup have separate cartridges for each color, so you don't waste valuable ink. In short, ink jet technology costs more per page, and the costs add up the more you print.

### WANT IT QUICK OR WANT IT PRETTY?

If you just want to print a typical letter or report—and don't need color—a laser printer is going to get the job done a lot faster. On PC Labs' Microsoft Word for Windows timed test, even the slowest laser printer was still faster than the fastest ink jet printer.

On the other hand, ink jet printers can be more versatile in handling paper; some come with settings to print on fanfold paper for banners or wide reports, which no personal laser printer can accommo-

**Our Contributors:** ALFRED POOR, BRUCE BROWN, DANIEL GROTTA, WINN L. ROSCH, M. DAVID STONE, and SALLY WIENER GROTTA are contributing editors of *PC Magazine*. WINN L. ROSCH is also the author of the newly revised *The Winn L. Rosch Hardware Bible, Premier Edition* (Sams Publishing, 1997), and M. DAVID STONE is the author of *The Underground Guide to Color Printers* (Addison-Wesley Developers Press, 1996). JAMES KARNEY is a frequent contributor to the magazine. JAMIE M. BSALES was the editor in charge of this story, and JEFF MACE was the project leader.



date. You can buy ink jet printers that can print on 11- by 17-inch (tabloid) paper for as little as \$500; tabloid-size lasers are at least \$2,000. This gives ink jets an advantage if you're looking for a single, all-purpose printer.

And then there is the color. The use of color in printed material, for both home and business purposes, goes far beyond simple reports. You may not need color often, but it's likely that once you see how well color ink jet printers perform, you'll want to use color in many print jobs, including posters, notices, correspondence, signs, cards, charts, and all types of graphic images.

#### INK JET: HOTBED OF TECHNOLOGY

The importance and future of personal ink jet photo printing is evidenced by the emergence of photo-centric printers. Models from Canon (the BJC-4304 Photo), Epson (Stylus Photo), and Hewlett-Packard (Photo-smart) can be used for other printing, but they are specifically designed and intended for printing photographic images. Advances in ink jet technology allow you to create prints with many models that rival traditional photographic processing.

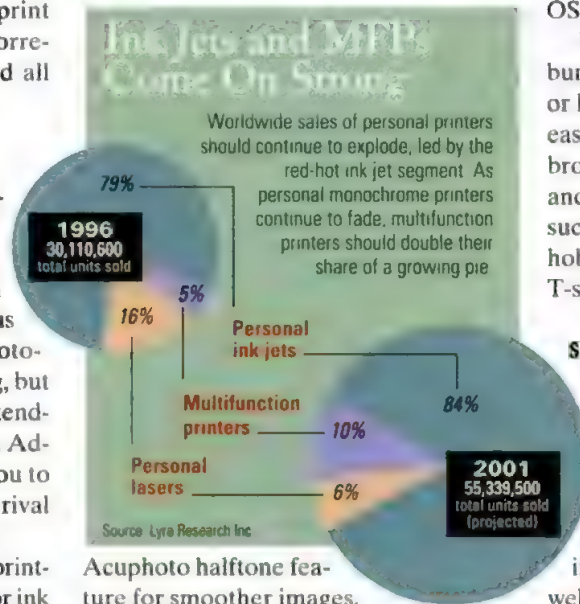
Indeed, while monochrome laser printing technology has matured, the major ink jet manufacturers are constantly pushing the envelope with color ink jet technology.

For its part, Hewlett-Packard (which was first to market an ink jet printer, in 1984) has rolled out its PhotoREt II and ColorSmart II technologies in the DeskJet 722C (an Editors' Choice) and DeskJet 890C. PhotoREt and ColorSmart optimize the size, shape, spacing, and placement of ink dots to improve photo image quality.

Canon is touting plain-paper-optimized printing (P-POP) on the BJC-7000 series, which lets you use the company's photo inks on plain paper (as opposed to expensive glossy photo stock). The printer lays down a "primer" layer, which makes the ink waterproof and photo images pop more (pun intended). The BJC-7000 also uses a seven-color printing process for better realism. The BJC-250 and the BJC-4300 series, meanwhile, use Drop Modulation Technology to create half-size ink dots for better gradations and detail in images. Canon also introduced a clever color scanning cartridge (\$99) that turns the BJC-80

and BJC-4304 Photo into color sheet-fed scanners with a resolution of 360 dots per inch (dpi), though we found scan times rather long.

Epson is moving away from the standard of offering separate "photo" ink cartridges for photo printing by making sure its regular inks are up to the task. Epson's Micro-Piezo print heads are designed to lay down smaller, sharper, rounder dots than those created using thermal print heads, and the Epson drivers have an



Acuphoto halftone feature for smoother images.

Lexmark, too, is working on precision control of ink drop size and placement. The payoff comes in smooth photo images and ultra-sharp black text. Indeed, we could not distinguish between text from the Color Jetprinter 7000 and that from a 600-dpi laser printer.

#### COMMON GROUND

It's also worth noting that there are a number of features that aren't so different between lasers and ink jets. For example, both lasers and ink jets are now easy to install and configure, largely thanks to Windows 95 Plug and Play, which all the printers in this review support. Most of these printers also feature driver applets that use pop-up screens from which you select print quality, paper size and type, and special color or monochrome printing effects.

Maintenance is easy for both printer types, with bidirectional signals sent between the printer and computer. You'll often know ahead of time when toner or

ink is getting low and when other maintenance or adjustments are needed.

There are also some features that individuals will care about for their particular needs, but you tend to find these with specific printer models, and not one technology or the other. For example, 9 of the lasers, 13 of the ink jets, and 5 of the MFPs print from Windows 3.x, Windows 95, or Windows NT only (though most also let you print from a DOS box in Windows). So if you use a legacy DOS application or OS/2, you have to shop carefully.

Most of the printers we tested come bundled with extra software for business or home printing tasks, with helpful and easy-to-use tools for creating Web pages; brochures, signs, posters, and letterhead; and myriad family-oriented applications such as comics, greeting cards, banners, hobby aids such as quilting patterns, and T-shirt transfers.

#### STANDALONE OR MFP?

By now you may have an idea if you want a laser or ink jet device. But have you considered that you might want something that can do more than merely print? The emergence of document management and digital imaging makes a unit that can scan as well as print appealing to a fairly broad audience, especially since the addition of a scanner means you can make photocopies right at your desk.

If you've got cramped quarters or a cramped budget, the MFP was designed for you. Taking all the business machine functions you need and stuffing them into one box solves the space problem that threatens to force your home office into a suite. And eliminating redundant functions among different individual machines helps manufacturers trim hardware construction costs.

The underlying philosophy is sound. Copying and fax machines share a need for the image-capture capabilities of a scanner and the hard-copy output of a printer. The multifunction printer combines them all—copying, fax, printing, and scanning—in one desktop package not much bigger or more expensive than an ordinary fax machine.

Paradise does have its problems, though. Whenever a jack-of-all-trades substitutes for the specialist, quality suf-





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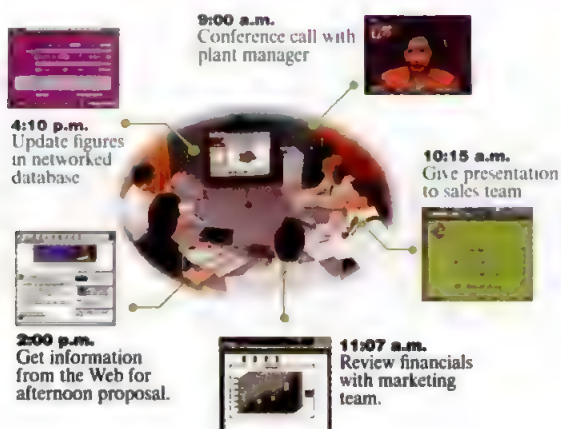
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fers. With the multifunction printers we tested, the compromise comes in scanning.

Early machines relied on fax scanners, limited to 200-dpi monochrome resolution. Although this new generation generally ups the ante to 300-dpi color scanning (with some claiming interpolated resolution at a wildly optimistic 2,400 dpi), they are still coarse in comparison to dedicated scanners. Moreover, only two machines in this roundup—the HP OfficeJet 1150Cse and Xerox Document HomeCentre—are able to scan bulky items such as books and magazines.

The real issue, however, is your own expectations: You can't expect the quality or convenience of a graphics arts scanner in a combination machine costing half the price. Besides, few business applications require more—all of the machines we review here are adequate for optical character recognition (OCR), and most of them include OCR software.

As with any emerging product area, the designs and even definitions of multifunction printing continue to evolve. Manufacturers are marching away from monochrome, incorporating color for printing (the Brother MFC-7000FC, the Canon MultiPass C3000, the Hewlett-Packard OfficeJet series, and the Xerox MFPs) and also for scanning and copying (the Brother MFC-7000FC and the HP OfficeJet 630 and OfficeJet 1150Cse). In a quest to cover all the bases, Brother has added color video capture and a telephone messaging center to the MFC-7000FC, our MFP Editors' Choice.

In fact, as the generalist multifunction printer becomes increasingly specialized, features have become the primary buying consideration. For example, if you don't need color, you can opt for laser-quality printing with the Brother MFC-4550 or the Panasonic KX-PS600. If you don't need yet another fax machine, choose one of the three machines in our roundup that don't include fax capabilities—the HP OfficeJet 1150Cse, the Panasonic KX-PS600, and the Xerox HomeCentre.

Sure, the choices can be overwhelming: first picking a technology, then deciding if you want other functions (and which ones). The reviews, tables, output samples, and assorted miscellany that follow should make narrowing the field a little easier.

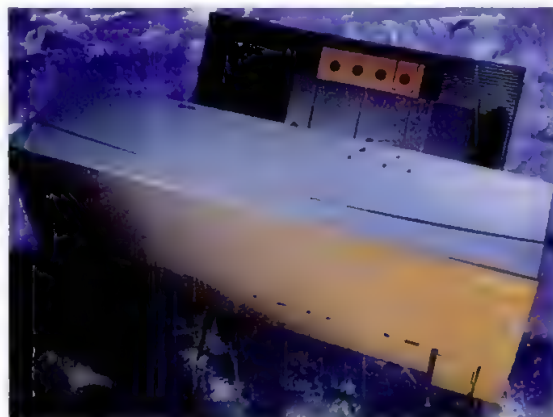
## color ink jet printers

### Alps MD-1000

*Letter-size 4-color Micro Dry. Monochrome: 2 ppm, 1,200 by 600 dpi. Color: 0.25 ppm, 1,200 by 600 dpi. Windows and Mac. \$350 street.*

Alps' MD-1000 is targeted at home and SOHO users who want an affordable, mess-free printer for text and graphics. Though the MD-1000 offers some unique capabilities, similarly priced ink jets offer better output quality.

The MD-1000's Micro Dry technology thermally embosses ink-coated plastic ribbons, spooled in typewriter-like cassettes, against the page. The ribbons are easy to install and remove, and each color can be replaced individually as it depletes, so it's economical, too. In addition, Alps sells metallic colors for special funky effects.



THE NEW MICRO DRY technology from Alps produced mixed results on its MD-1000 unit.

Setup overall is trouble-free. The user can determine the output type by selecting from a number of preset modes: automatic, business graphics, graphic art, photograph, monochrome picture, monochrome text, spot color, metallic with full color, and custom.

Output quality was mixed. Black text was among the best we saw from a printer in this class. Small areas of color also looked good, with rich, saturated colors. Larger blocks of color, however, tended to be mottled with white dropouts, and we were able to see the half-inch swath

of the ribbon. Because of the ribbon and paper transport systems, the MD-1000 is not particularly fast: It posted below-average speeds on most of our tests, and it doesn't stop printing when one of the cartridges is empty.

Alps has attempted to break the color printer mold with new technology. But an ink jet may be your better choice.—Daniel Grotta and Sally Wiener Grotta

**Alps Electric (USA) Inc.**, San Jose, CA; 800-825-2577, 408-432-6000; [www.alpsusa.com](http://www.alpsusa.com). Circle 472 on reader service card.

### Apple Color StyleWriter 6500

*Legal-size 4-color ink jet. Monochrome: 8 ppm, 600 by 600 dpi. Color: 4 ppm, 600 by 300 dpi. Windows and Macintosh. \$430 street.*

Apple Computer's Color StyleWriter 6500 is a capable, general-purpose four-color ink jet printer intended for the home, school, and small- to medium-size business markets. Equipped with PC and Mac interfaces and network-capable in both environments, the Color StyleWriter 6500 is particularly appropriate for implementations where both types of computers are used.

Based on HP's 800-series technology, the StyleWriter comes bundled with software emphasizing business and personal needs, including Mind-scape's PrintMaster Gold (for letterhead, cards, labels, notes, signs, and posters), Now Up-to-Date (a calendar and contact list), and Web It! (for flow and org charts, storyboards, maps, and Web pages).

On our objective quality tests, the StyleWriter 6500 garnered consistently poor marks. In subjective analysis, however, black text output looked good, with no fuzziness at all. Gray-scale printing had visible banding, however, and color graphics output was a bit rough in texture compared with the top-tested printers. On the plus side, the Apple proved amply



speedy for business users: The Color StyleWriter 6500 was among the fastest printers on all of our application-based speed tests.

The Apple Color StyleWriter 6500 is a leader in its ability to work in standalone or network mode for PC, Mac, and mixed applications. Its color and graphics output, though not the greatest, is passable, and its speed and its low operating cost make it a fine choice for most users.

—Bruce Brown

**Apple Computer Corp.**, Cupertino, CA; 800-776-2333; [www.apple.com](http://www.apple.com). Circle 471 on reader service card.

### Canon BJC-80, BJC-250, BJC-4304 Photo, BJC-620, BJC-7000

**BJC-80:** Legal-size 4-color portable ink jet. Monochrome: 4.5 ppm, 720 by 360 dpi. Color: 2 ppm, 720 by 360 dpi. Windows only. \$300 street.

**BJC-250:** Legal-size 3-color ink jet. Monochrome: 4 ppm, 720 by 360 dpi. Color: .5 ppm, 360 by 360 dpi. Windows only. \$150 street.

**BJC-4304 PHOTO:** Legal-size 4-color ink jet. Monochrome: 5 ppm, 720 by 360 dpi. Color: 2 ppm, 720 by 360 dpi. Windows only. \$240 street.

**BJC-620:** Legal-size 4-color ink jet. Monochrome: 3 ppm, 720 by 720 dpi. Color: 1.7 ppm, 720 by 720 dpi. Windows only. \$300 street.

**BJC-7000:** Legal-size 7-color ink jet. Monochrome: 5 ppm, 1,200 by 600 dpi. Color: 3.5 ppm, 1,200 by 600 dpi. Windows only. \$450 street.

These five budget-priced offerings from Canon Computer Systems run the gamut from entry-level text printer to portable business printer. Though performance and features vary, software support and bundled extras are universally good. All units include a comprehensive package of applications, utilities, fonts, templates, and clip art, and all come bundled with Canon's InstantExchange service, which ships a cost-free replacement within one business day if your printer needs repair under warranty.

#### BJC-250: BARGAIN PRICE

The entry-level unit is the BJC-250 three-color ink jet, designed for student and family users. Though it lacks the frills we'd associate with a more expensive de-

vice, it's a competent if unexceptional workhorse for budget-conscious buyers. Setup and swapping between black and color cartridges is simple. When enabled, the printer's automatic detection system correctly matches paper and ink. Unfortunately, there's no automatic cartridge depletion warning, so the unit will continue printing even when one of the ink wells runs out.

On our objective output tests, the print quality was uniformly poor, posting low marks in all of the categories. To the naked eye, however, printouts looked average for a low-end ink jet with text and business graphics. Registration seemed bang-on accurate, and printed type was dark and crisp. But when we generated photos and blocks of color, the limitations of the BJC-250's modest 360-by-360 dpi resolution became apparent. Even when using the best media and optimum settings, we clearly saw mottling, dot patterns and streaking, and somewhat over-

who need to print graphics. It should suit your needs if you're willing to accept relatively slow speed in exchange for attractive photorealistic images. Unlike comparably priced printers, it uses four individually replaceable ink cartridges for greater economy. The driver offers various presets for selecting media and output type, and color management is automatic thanks to Canon's proprietary color matching utility (compatible with ColorSync 2.0). ColorMatch has a set of user-controllable graphical sliders for adjusting brightness, saturation, and contrast.

In subjective evaluation, the BJC-620's output was impressive. Colors were saturated and realistic, and skin tones were subtle and pleasing. Some banding was evident in gradients, but type was razor-sharp and extra black. Print speed was generally good for graphics applications, but the printer was noticeably slow on our Microsoft Word test. Overall, the high quality of its printouts makes the BJC-620 a good choice for photo and business graphics uses.

#### BJC-4304 PHOTO: PRINT AND SCAN

The BJC-4304 Photo is Canon's entry into the photo-specific ink jet niche, though relatively good performance makes it suitable for a range of business and SOHO tasks. The BJC-4304 uses Canon's new Drop Modulation Technology, which prints using a mixture of full- and half-sized ink drops. In conjunction with multipass overlap printing in photo mode, the effective result is enhanced resolution and image quality. For text enhancement, the printer

uses Image Optimizer, an anti-aliasing algorithm. Even more groundbreaking, the BJC-4304 can double as a 360-dpi sheet-fed color scanner if you install an optional \$99 scan head.

Type output from the printer was crisp and lines looked clean. Blocks of color were solid and smooth, and both graphics color and skin tones were generally accurate and pleasing. Gradient banding was less pronounced than with the BJC-620, but the dot pattern was more evident in photographs. To test the scanning feature,



THE BJC-7000, from Canon, features a new Instant-dry technology and seven-color output.

saturated colors. We saw no significant difference in output quality between photo ink and the less expensive standard color cartridge, except that the photo ink output showed reduced contrast when printed on glossy paper. Throughput speed was acceptable for a unit in this class. If price is paramount, the BJC-250 may fill the bill.

#### BJC-620: BUSINESS WORKHORSE

Canon's BJC-620 is a higher-resolution unit designed for business and home users

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we swapped the print head for the scan head, installed the Twain driver, and scanned in an 8- by 10-inch photograph. Although slow, jerky, and lacking all but the most rudimentary image-manipulation tools, the image quality in the highlights and midtones was comparable to that of any sheet-fed color scanner. Overall, the BJC-4304 Photo is a good choice for those who want a bargain business-and-photo printer and who need an occasional image scan.

#### BJC-7000: 7-COLOR GRAPHICS

Canon's higher-end BJC-7000, targeted at business and graphics professionals, showcases new technologies for improving graphics output. For openers, the printer is the only seven-color ink jet on the market. It prints in CMYK as well as in lighter hues of the primary colors, which Canon claims gives it more accurate colors and finer gradients. The wider head swathe allows for edge-to-edge 8.5- by 11-inch printing. It even has what Canon calls P-POP, or Plain-Paper Optimized Printing, an instant-dry coating that prevents inks from spreading and bleeding when applied to plain paper, and that also makes them waterproof.

The software interface is comprehensive but not complicated, and it gives users the choice of accepting a wide variety of presets or creating user-definable settings. Its color-management system can match printer output to scanner or digital camera input and to the monitor display.

For all its vaunted technology, output quality was average. To the naked eye, text and images seemed sharp and well-defined, and colors were good; but skin tones tended to look slightly washed out. This was also the only printer in the roundup that flunked the registration test. The BJC-7000 was also slow on a number of our speed tests.

#### BJC-80: PORTABLE POWERHOUSE

On the other hand, Canon's portable BJC-80 scored surprisingly well on our performance and output tests. A stylish brick-sized printer, it's small and light

enough—about 3 pounds—to accompany your laptop, yet capable of producing desktop-quality business text and graphics.

Like the BJC-4904 Photo, the BJC-80 uses Canon's resolution-enhancing Drop Modulation Technology. With an optional \$99 scan head, it can also double as a sheet-fed scanner. Setup is fairly easy, consisting of installing Plug and Play software and snapping in two tiny ink cartridges. The IrDA port makes setup on the road a snap. The documentation says you can also insert as many as 30 sheets of paper, but we could put in only 10 during setup without a misfeed. We also occasionally experienced a problem with ink dropouts on parallel lines, which eventu-



**QUICK AND CAPABLE**, the Epson Stylus Color 800 is an Editors' Choice for business and SOHO users.

ally required us to change the print head.

The BJC-80 produced some of the best prints of all the Canon printers we tested. Subjectively, color gradients seemed to exhibit minimal banding, colors were bright and accurate without oversaturation, and skin tones were realistic and pleasing. Text quality rivaled even laser output.

On almost every task, this printer proved faster than every other Canon ink jet. The BJC-80 is a winner, whether you measure it by size, price, portability, or image quality.—*DG and SWG*

**Canon Computer Systems Inc.**, Costa Mesa, CA; 800-848-4123, 714-438-3000; [www.ccsi.canon.com](http://www.ccsi.canon.com). Circle 473 on reader service card.

## Epson Stylus Color 400, 600, 800, 1520, Stylus Photo



**Stylus Color 400:** Legal-size 4-color ink jet. Monochrome: 4 ppm, 720 by 720 dpi. Color: 3 ppm, 720 by 720 dpi. Windows only. \$200 street.

**Stylus Color 600:** Legal-size 4-color ink jet. Monochrome: 6 ppm, 1,440 by 720 dpi. Color: 4 ppm, 1,440 by 720 dpi. \$300 street.

**Stylus Color 800:** Legal-size 4-color ink jet. Monochrome: 8 ppm, 1,440 by 720 dpi. Color: 7 ppm, 1,440 by 720 dpi. \$400 street.

**Stylus Color 1520:** Tabloid-size 4-color ink jet. Monochrome: 6 ppm, 1,440 by 720 dpi. Color: 5 ppm, 1,440 by 720 dpi. \$800 street.

**Stylus Photo:** Legal-size 6-color photo ink jet. Monochrome: 720 by 720 dpi. Color: 720 by 720 dpi. No speed rating. \$500 street.

Epson America has charged ahead this year with its successful Epson Stylus Color line. These five new ink jets range from an entry-level home unit to a special-purpose photo device to a large-format professional model. All are high-resolution printers that performed best in their class on our objective print quality tests, thanks to Epson's new Micro Piezo printing technology, which produces small, consistently sized dots of ink. Each Stylus does an excellent job of producing text and photo images onto a variety of media.

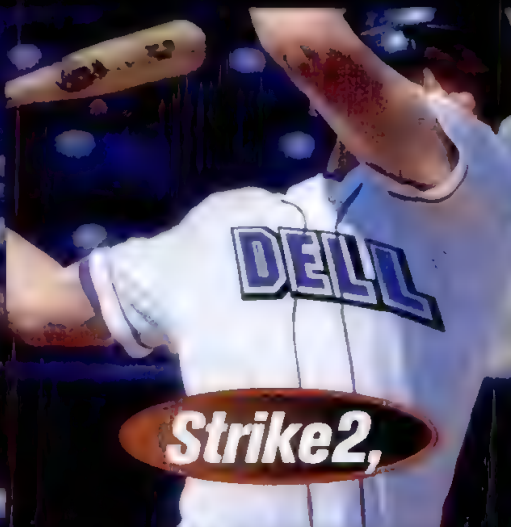
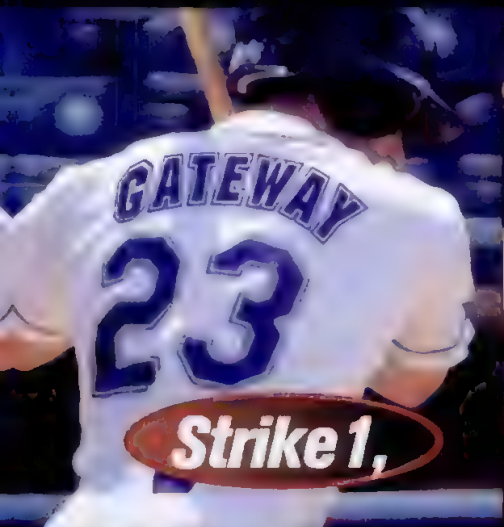
#### STYLUS 400: ENTRY-LEVEL BARGAIN

The Stylus Color 400 is an entry-level printer targeted at the home and family market; Sierra Print Artist and Adobe Photo Deluxe are included. A great bargain, it would make a fine starter printer for new users or a second printer for homes with multiple computers. In subjective evaluation, we saw some minor banding in color graphics printing in normal mode on plain paper, though monochrome text was crisp and dark. For such an inexpensive printer, however, it produced outstanding results when we tested photographic images and mixed graphic and photo images in the best mode on photo paper.

Although the unit was relatively slow when printing black text in Microsoft



# HEY, GATEWAY, DELL & MICRON...

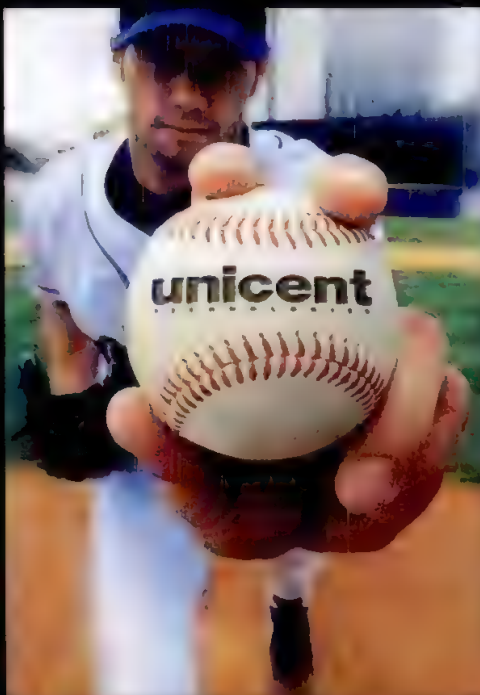


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BENCHMARK TESTS

# Color Ink Jet Printers



The output quality of color ink jet printers has improved every year, and this year is no exception.

More than ever, these low-priced units are approaching the quality of much more expensive thermal dye solutions. But there's a trade-off: slower print times.

## What the Numbers Mean

To create high-quality output, most ink jets offer more than one high-resolution mode. The print arm may do multiple passes, use a slow-pass mode to allow the print heads to render finer dots, or combine the two techniques. Many ink jets also have separate mode settings for monochrome output, and to maximize speed during black-and-white jobs, most have separate black-only cartridges.

A majority of the ink jets in this roundup are GDI (Graphics Device Interface) printers, meaning that they have no internal processors and rely on the host computer's CPU to create (or rasterize) images. But a printer with a processor on-board will often have the speed advantage; it can perform rasterizations while the computer's CPU is performing other tasks.

**Speed Tests:** Our color speed test in Microsoft Excel is designed to test general office printing and to determine how quickly a given printer will perform for general business uses. The top performers were the Epson Stylus Color 800 and Stylus Color 1520. The slowest time on the color Excel test was posted by the Olivetti JP-90, a portable printer intended mostly for text output on the road. Since the test file contained mostly black, except for a few color charts, this three-color (CMY) printer struggled because it had to combine 100 percent of each ink to create black. Similarly, the HP Photosmart took eight times longer than the fastest printer.

The HP DeskJet 890C was the fastest performer on our Photo-shop test. On the same test, the Canon BJC-80 (another portable) took the longest time to print our TIFF file. Its 720- by 360-dpi resolution (with fine mode on) took four passes to render its best output. Notably, the fastest performers across all speed tests were the HP DeskJet 1000Cse and DeskJet 400L.

**Objective Print-Quality Tests:** To take a deeper look at ink jet performance from the viewpoint of output quality, we enlisted the assistance of KDY, a firm in Nashua, New Hampshire, specializing

in image-quality analysis for printers and scanners. KDY used its ImageXpert system, an industry standard that automates the analysis of image quality for printer and paper manufacturers. ImageXpert is based on Image Analyst by Acuity Imaging, an RVSI Company.

We produced output samples for KDY using the best-quality

|                                                          | Microsoft Word<br>(monochrome) | Microsoft Excel<br>(monochrome) |
|----------------------------------------------------------|--------------------------------|---------------------------------|
| <b>Bold type denotes first place.</b><br>Minutes:seconds |                                |                                 |
| Alpe MD-1000                                             | 8:43                           | 2:52                            |
| Apple Color StyleWriter 6500                             | 1:49                           | 1:30                            |
| Canon BJC-80                                             | 2:25                           | 0:53                            |
| Canon BJC-250                                            | 2:30                           | 1:23                            |
| Canon BJC-4304 Photo                                     | 2:43                           | 1:28                            |
| Canon BJC-620                                            | 5:25                           | 2:25                            |
| Canon BJC-7000                                           | 3:03                           | 1:33                            |
| Epson Stylus Color 400                                   | 5:20                           | 1:15                            |
| Epson Stylus Color 600                                   | 2:32                           | 3:00                            |
| Epson Stylus Color 800                                   | 1:23                           | 0:36                            |
| Epson Stylus Photo                                       | 6:12                           | 2:54                            |
| Epson Stylus Color 1520                                  | 1:36                           | 0:43                            |
| HP DeskJet 400L                                          | 2:58                           | 1:40                            |
| HP DeskJet 672C                                          | 3:06                           | 1:55                            |
| HP DeskJet 694C                                          | 2:58                           | 1:58                            |
| HP DeskJet 722C                                          | 1:58                           | 3:26                            |
| HP DeskJet 890C                                          | 1:54                           | 2:45                            |
| HP DeskJet 1000Cse                                       | 2:33                           | 1:42                            |
| HP Photosmart                                            | 11:09                          | 7:19                            |
| HP DeskJet 1600CM                                        | 1:21                           | 2:14                            |
| Lexmark Color JetPrinter 1000                            | 3:17                           | 1:45                            |
| Lexmark Color JetPrinter 2030                            | 3:20                           | 1:41                            |
| Lexmark Color JetPrinter 3000                            | 3:13                           | 1:38                            |
| Lexmark Color JetPrinter 7000                            | 2:14                           | 0:53                            |
| Olivetti JP 90                                           | 3:47                           | 2:31                            |

◀ BETTER

◀ BETTER

N/A—Not applicable. This printer could not print our test file.

Word, it was among the fastest printers on our other application-based speed tests. All in all, the Stylus Color 400 is an excellent buy for light-duty and home-office users.

### STYLUS 600: WORTH THE EXTRA \$100

The Epson Stylus Color 600 is targeted at the home user who wants top-quality output and the ability to print fine photo images. It hits its mark; the upgraded features

and output quality are well worth the slightly higher price. This unit increases the maximum print resolution and works with both the Macintosh and the PC; it comes with the same software bundled as the 400.

Even on plain paper, black text printed deep and dark on our tests, with consistent coloration and firm edges. Color graphics prints were also noticeably richer than the 400, with minimal banding in full-page,

100 percent color coverage. Photographic image prints, especially on Epson's special photo papers, were outstanding, with clear detail and lifelike colors.

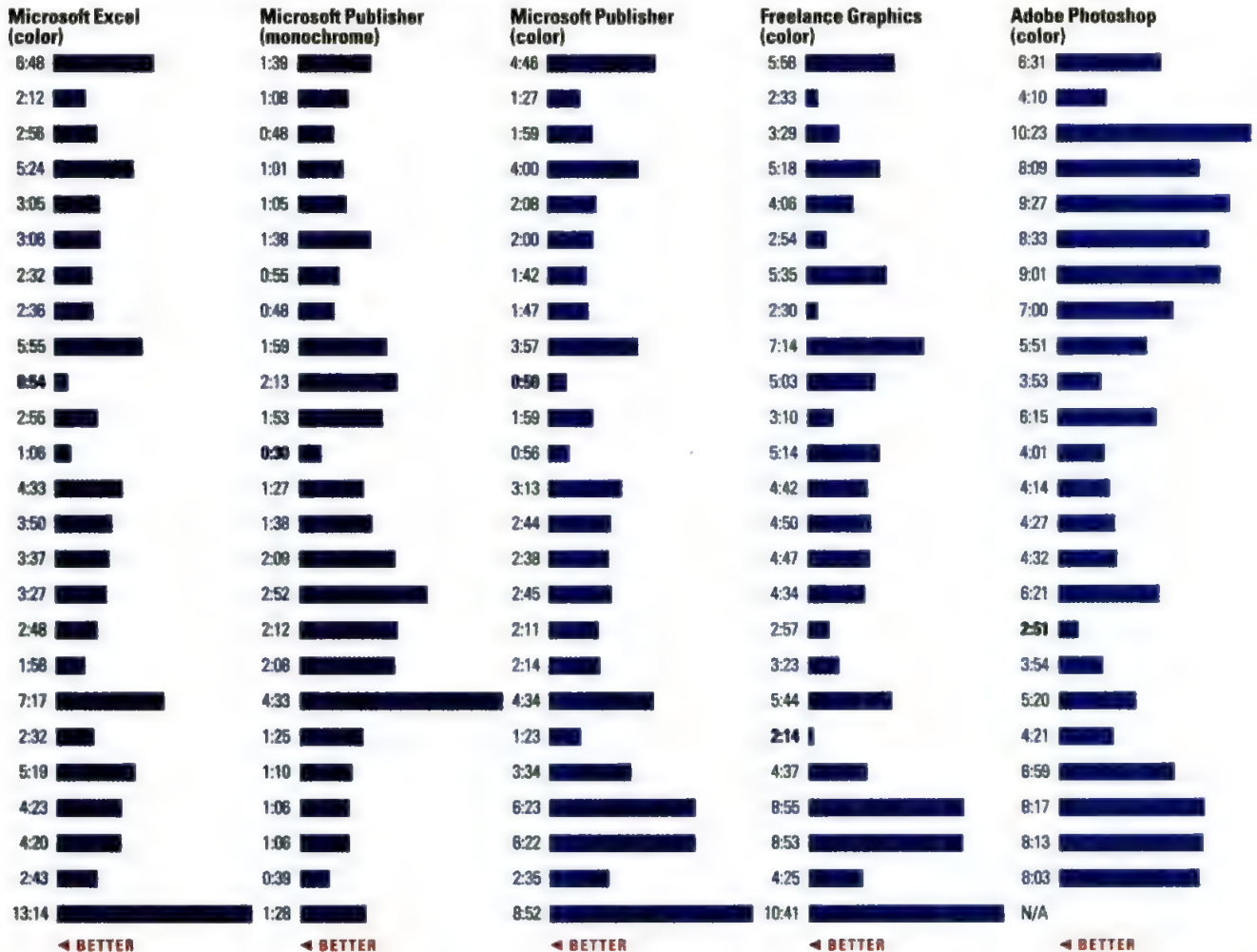
On our speed tests, the Stylus Color 600 produced mixed results. Its time on our Microsoft Word test was competitive, but it lagged the others on most of the other applications tests. Still, for families that want greater flexibility and are ready

mode each printer offered and the highest-quality paper the vendor offered. We sent samples to KDY, identified only by number to ensure anonymity. KDY analyzed the samples for four parameters: dot quality, resolution, raggedness, and detectability. We translated the numeric results into three tiers of performance (good, fair, poor) in each area.

The *dot quality* score is based on statistics derived by analyzing the dots in the image, such as the standard deviation of the average area of all the dots in the target, and the aspect ratio (roundness) of the dots, as well as the standard deviation of the gray average. This

test will reveal poor color registration. Dithering quality and the ability to render shadow areas that don't look streaky depend on good results here. Missing dots can be caused by the collapse of two or more dots to create one larger one. In many cases, poor results demonstrate a problem with the ink itself.

As the *resolution* score indicates, if the lines can be clearly distinguished in a pattern of converging lines, the printer can produce a high-resolution image. When printing lines in high frequency, ink bleeding and printer motion problems have a direct bearing on the printer's resolution. In high-frequency printing the image gets



to make a step up in color print quality, the Epson Stylus Color 600 is a fine choice.

#### STYLUS 800: DOWN TO BUSINESS

Business users will be interested in Epson's well-designed Stylus Color 800, our Editors' Choice among business-oriented ink jets. This printer has the same resolution and print modes as the 600 but adds higher output speeds and optional

internal network connectivity (\$399 for Ethernet card) to suit the needs of corporate offices. Indeed, it was one of the fastest ink jets we tested.

Text and business graphics printing were top-notch, though we saw some minor banding on plain paper during dense color printing. The banding disappeared when we switched to the highest-quality mode on photo paper, resulting in outstanding image

quality. Mainstream corporate users should consider the Stylus 800.

#### STYLUS 1520: OVERSIZE OUTPUT

If you need to print tabloid-size business and graphics documents without compromising features, speed, or output quality, then Epson's Stylus Color has got your number. It has all the mechanics and capabilities of the 800 model but adds the abil-



## BENCHMARK TESTS

darker because the lines are getting too close, where bleeding and other effects are more dominant. Therefore, the resolution suffers as the white space between the lines is blended with the lines.

The *raggedness* (or *line quality*) score defines how jagged a printed line is. In the ideal case, the edges are completely smooth. The results show the varying smoothness of the lines. Raggedness is defined as the displacement of the black/white boundary from its ideal baseline. A rough edge with lots of jaggies has a bad effect on OCR. Edges will be blurred on all types of printing jobs. This test is a good way to test the motion of the head and the electronics that control the application of the ink.

The *detectability* score measures how well a printer can print a white line surrounded by black. Ideally, the line should be white, clean of all defect; in the worst cases the line is broken. Good results on this test indicate that the printer will render text well and produce desirable OCR results. Images will also have fine detail.

Across all four parameters, almost the full roster of Epson printers attained ratings of *good*. Three Lexmark entries and the Canon BJC-80 and BJC-7000 demonstrated excellent resolution. The Alps MD-1000 also scored well on three of the four measures

Objective print quality

|                               | ● Good | ● Fair | ● Poor | Dot quality | Resolution | Raggedness | Detectability |
|-------------------------------|--------|--------|--------|-------------|------------|------------|---------------|
| Alps MD-1000                  | ●      | ●      | ●      | ●           | ●          | ●          | ●             |
| Apple Color StyleWriter 6500  | ●      | ●      | ●      | ●           | ●          | ●          | ●             |
| Canon BJC-80                  | ●      | ●      | ●      | ●           | ●          | ●          | ●             |
| Canon BJC-250                 | ●      | ●      | ●      | ●           | ●          | ●          | ●             |
| Canon BJC-4304 Photo          | ●      | ●      | ●      | ●           | ●          | ●          | ●             |
| Canon BJC-620                 | ●      | ●      | ●      | ●           | ●          | ●          | ●             |
| Canon BJC-7000                | ●      | ●      | ●      | ●           | ●          | ●          | ●             |
| Epson Stylus Color 400        | ●      | ●      | ●      | ●           | ●          | ●          | ●             |
| Epson Stylus Color 600        | ●      | ●      | ●      | ●           | ●          | ●          | ●             |
| Epson Stylus Color 800        | ●      | ●      | ●      | ●           | ●          | ●          | ●             |
| Epson Stylus Photo            | ●      | ●      | ●      | ●           | ●          | ●          | ●             |
| Epson Stylus Color 1520       | ●      | ●      | ●      | ●           | ●          | ●          | ●             |
| HP DeskJet 400L               | ●      | ●      | ●      | ●           | ●          | ●          | ●             |
| HP DeskJet 672C               | ●      | ●      | ●      | ●           | ●          | ●          | ●             |
| HP DeskJet 694C               | ●      | ●      | ●      | ●           | ●          | ●          | ●             |
| HP DeskJet 722C               | ●      | ●      | ●      | ●           | ●          | ●          | ●             |
| HP DeskJet 890C               | ●      | ●      | ●      | ●           | ●          | ●          | ●             |
| HP DeskJet 1000Cse            | ●      | ●      | ●      | ●           | ●          | ●          | ●             |
| HP Photosmart                 | ●      | ●      | ●      | ●           | ●          | ●          | ●             |
| HP DeskJet 1600CM             | ●      | ●      | ●      | ●           | ●          | ●          | ●             |
| Lexmark Color Jetprinter 1000 | ●      | ●      | ●      | ●           | ●          | ●          | ●             |
| Lexmark Color Jetprinter 2030 | ●      | ●      | ●      | ●           | ●          | ●          | ●             |
| Lexmark Color Jetprinter 3000 | ●      | ●      | ●      | ●           | ●          | ●          | ●             |
| Lexmark Color Jetprinter 7000 | ●      | ●      | ●      | ●           | ●          | ●          | ●             |
| Olivetti JP 90                | N/A    | N/A    | N/A    | N/A         | N/A        | N/A        | N/A           |

N/A—Not applicable. This product could not print our test files.

ity to handle sheets up to 17 by 22 inches. It's a good choice for a broad range of uses in the home, school, or office.

The Stylus Color 1520's flexible paper handling is bolstered by the inclusion of a standard tractor feed for fanfold paper. Epson also sells special paper for this printer, including coated stock in standard B-size (11-by-17) and super B-size (13-by-19; \$3 per sheet), as well as glossy photo stock

(B-size, \$4 per sheet; super B, \$5 per sheet). The 1520 has the same standard high-speed ports and optional network connectivity as the Stylus Color 800, and it was among the fastest printers on our tests.

Output quality was similar as well: some banding on plain paper but near-photo-quality on the more expensive media. One drawback: The ink tanks, smallish for a tabloid-size printer, make

(resolution, raggedness, detectability). The Canon BJC-7000 and the HP Photosmart did well on the dot quality test. The Canon BJC-4304 Photo, the HP DeskJet 722C and 1600CM, and the Lexmark Color Jetprinter 2030 did not fare well on these low-level tests. —*Analysis written by Jeff Mace, with special thanks to Dave Wolin and Scott Cole of KDY (603-598-2500; kdy@acut.com; www.imageexpert.com).*

## How We Tested

The **Microsoft Word** test prints a five-page black-and-white text document that uses different fonts and type sizes.

The **Microsoft Excel** test prints a two-page spreadsheet with color line graphs, bar graphs, and pie charts. We also ran this test in monochrome.

The **Microsoft Publisher** test prints a one-page newsletter containing text, graphics, and a color bitmapped photo image. We also ran this test in monochrome.

The **Freelance Graphics** test prints a three-page color slide presentation containing pie charts, bar graphs, and a photo image on a gradient-filled background.

The **Adobe Photoshop** test prints a one-page color photographic image.

We tested on a Micron Millennia Pentium 200 with 32MB of RAM, a 2.1GB Western Digital Caviar hard disk, and an 8X Hitachi CD-ROM drive. We ran each speed test twice, and we present the average of each unit's scores on the chart.

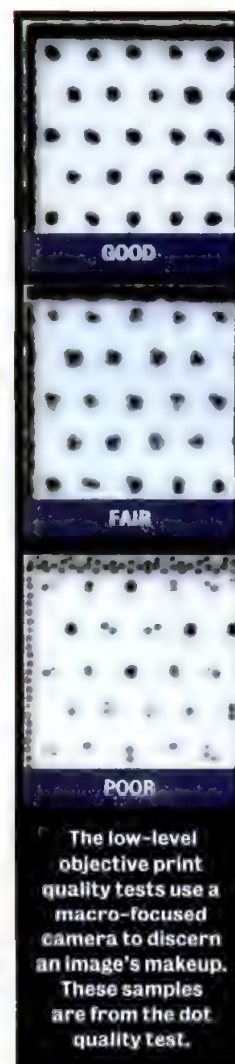
These application tests used files that PC Labs designed to expose each printer to print jobs typical of most users. We used the default print setting within each application, and the most appropriate mode available within each printer's driver interface for printing that type of job. For example, if we were printing a monochrome image, we used a driver setting for monochrome if available. Similarly, for Photoshop tests, we used the setting for the best photo-realistic output. Outside of mode changes, we used the printer's defaults for all tests.

For the objective print-quality tests, we scanned the KDY target at 600 dpi. We printed the file using PhotoShop, with the Use Printer Defaults option on.

this unit better for jobs with just some color; color-intensive users should consider Epson's Stylus Color 3000 (\$2,000 street), a graphics printer we reviewed in our October 21 issue. For business users, the Epson Stylus Color 1520 a top choice.

### STYLUS PHOTO: PERSONAL FOTOMAT

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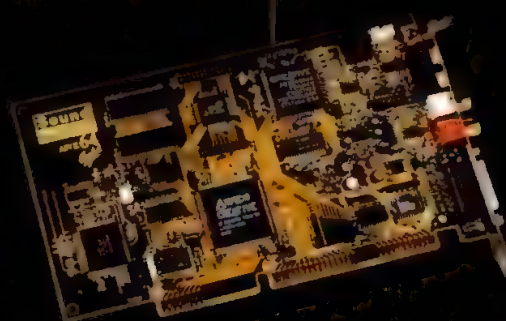
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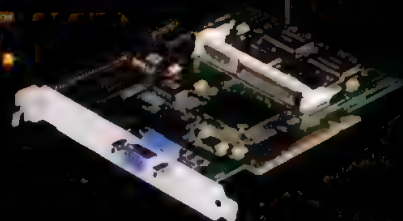
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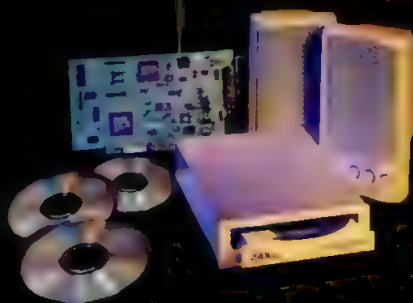
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the Epson Stylus Photo is worthy of your attention. The company targets this well-designed printer at business, home, hobbyist, and professional users. The Stylus Photo uses six-color printing and Epson's Micro Piezo technology for added color gradations and smoothness.

Compatible with both PCs and Macintoshes, it comes bundled with Microsoft's LivePix 1.1 photo-editing and enhancement software. There is also an option that includes Adobe PostScript with Pantone-calibrated colors, which generates impressive panorama and landscape-mode printing.

The slowest of the reviewed Epson printers and generally slower than average, the Stylus Photo can still turn out crisp black text and rich color graphics. But the best use for this printer is photographic image printing, and its output results were excellent on our tests. Close examination showed outstanding print quality on special ink jet paper (11 cents a sheet), and stunning photo printing on glossy photo paper (55 cents a sheet).

No matter which model you choose from the Epson Stylus line, you're likely to be pleased with the results.—BB  
**Epson America Inc.**, Torrance, CA; 800-463-7766, 310-782-0770; [www.epson.com](http://www.epson.com). Circle 474 on reader service card.

## HP DeskJet 400L, 672C, 694C, 722C, 890Cse, 1000Cse, 1600CM, Photosmart



**DeskJet 400L:** Legal-size 3-color ink jet. Monochrome: 2 ppm, 600 by 300 dpi. Color: 2 ppm, 300 by 300 dpi. \$150 street.

**DeskJet 672C:** Legal-size 4-color ink jet. Monochrome: 4 ppm, 600 dpi. Color: 1.5 ppm, 600 by 300 dpi.

\$200 street.

**DeskJet 694C:** Legal-size 6-color ink jet. Monochrome: 5 ppm, 600 dpi. Color: 1.7 ppm, 600 by 300 dpi. \$300 street.

**DeskJet 722C:** Legal-size 4-color ink jet. Monochrome: 8 ppm, 600 dpi. Color: 4 ppm, 600 dpi. Windows only. \$300 street.

**DeskJet 890Cse:** Legal-size 4-color ink jet. Monochrome: 9 ppm, 600 dpi. Color: 5 ppm, 600 dpi. \$450 street.



WITH ITS BUNDLED RISC processor, the network-ready HP 890Cse generates fast, attractive printouts.

**DeskJet 1000Cse:** Tabloid-size 4-color ink jet. Monochrome: 6 ppm, 600 dpi. Color: 3.5 ppm, 600 dpi. Windows only. \$500 street.

**DeskJet 1600CM:** Tabloid-size 4-color network ink jet. Monochrome: 9 ppm, 600 dpi. Color: 4 ppm, 600 dpi. \$2,000 street.

**Photosmart:** Letter-size 6-color photo ink jet. No resolution or speed ratings. \$500 street.

The size and diversity of the ink jet printer market can be measured by the number of models Hewlett-Packard submitted for this roundup. This group of eight includes seven brand-new designs, plus the network-ready and Postscript-compatible DeskJet 1600CM, a past Editors' Choice winner. These machines cover a wide range of user needs and price points and generally succeed in meeting the needs of their respective target markets.

### DESKJET 400L: BARE BONES

The HP DeskJet 400L (\$150 street) is a three-color printer targeted at budget-constrained home users and students. The 400L comes with a black cartridge, but you have to buy the color ink cartridge separately, a trend in the low-cost arena that we don't applaud. There's also no application software, and color printing is a high 23 cents per page (at 15 percent coverage). Its small footprint (7 by 13.7 by 6.4 inches) will fit on even cramped desktops.

On our tests, output quality was relatively rough, and there was banding in

color, gray-scale, and photographic printing. Text was satisfactory, however, and the 400L should be fine for school papers and correspondence, especially since monochrome operating costs are low, at 3 cents a page for 5 percent black coverage. Print speed was average in all categories. Still, you can get a lot more printer for just a little more money from HP as well as from other vendors.

### DESKJET 672C: FAMILY VALUE

The DeskJet 672C (\$200 street) is Hewlett-Packard's least expensive four-color printer. Targeted for home users, it's a great deal for those who want color output but don't intend to print photos. The 672C comes bundled with the Print-Paks Pop-Up Greetings Kit II, as

well as sample paper and matching envelopes for making greeting cards. Operating costs are moderate, at 4 cents per page with 5 percent black coverage and 10 cents for 15 percent color coverage.

Our objective tests showed disappointing results for the 672C, with poor scores on all four of our test criteria. To the naked eye, however, things looked somewhat better. Output samples showed much darker blacks and richer colors than the 400L, with less banding. Speed test scores were a bit slower than the 400L's but well within the average range for this roundup. Although the DeskJet 672C may not generate ideal color output, its target audience isn't in the high-end market. It's a good buy for budget-conscious families.

### DESKJET 694C: A BIT BETTER

The HP DeskJet 694C raises the bar by adding a photo ink cartridge and bundling an attractive, home-oriented software package. For families that intend to print photos occasionally and are willing to pay for another notch in print quality, the 694C is a good value.

Three ink cartridges come standard with the printer: monochrome, color, and the special photo ink. Using the photo ink on HP's Premium Glossy Paper (\$12.95 for ten sheets), the 694C can generate six-color photographic prints. The unit also ships with the HP Photo Project CD, which includes Storm Technology's Easy Photo



# Snap, Scan, Print: Putting the Pieces Together

So you have a color scanner, maybe a digital camera, and you (rightly) expect that these tools will let you get great images out of your photo-quality ink jet printer. Think again. There is a wide range of scanners, cameras, and printers on the market, plus any number of ways of massaging digital images with software. Start counting all the combinations, and you'll quickly appreciate why getting good-looking digital photo output is rarely as easy as simply capturing or scanning a picture and then printing. Fortunately, astute hardware vendors have recognized the problem and are working on solutions.

The overriding issue for digital images is color-matching. The camera or scanner captures an image using its own color settings, which will vary from one camera or scanner to the next and which are usually not calibrated to any particular printer.

An additional issue with digital cameras is that they tend to offer low resolution. A digital photo taken at 640 by 480 and stretched to print at 8 by 10 inches simply doesn't have enough digital data in it to print without *pixelization*, where the individual pixels create a blocky effect. Most scanners will let you scan images at higher resolutions than cameras offer, but file sizes (and print times) can get inordinately bloated.

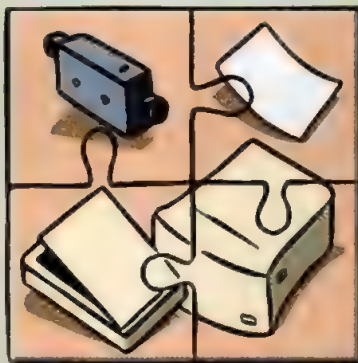
The emerging solution is to get matched components that are designed specifically for photos and cover the entire process from soup to nuts—camera, scanner, image-editing software, and printer.

Hewlett-Packard offers the Photosmart Printer (\$500 street), the Photosmart Scanner (\$500), and the Photosmart

Digital Camera (\$300). The scanner can accept negatives, 35-mm slides, or film prints up to 5 by 7 inches. You won't have to worry about color-matching because the scanner and printer are color-calibrated to each other. Easy-to-use scanning software lets you adjust the brightness, tint, and saturation on a prescan, specify the size image to print, and then give the print command without having to worry about the best scanning resolution to use. The camera comes with Microsoft PictureIt! for downloading, tweaking, and printing the image. As with the scanner, the camera is color-calibrated with the printer. However, the 640-by-480 resolution limits picture size you can reasonably print. (Hewlett-Packard Co., Palo Alto, CA; 888-474-3867; [www.hp.com/go/photosmart](http://www.hp.com/go/photosmart). Circle 475 on reader service card.)

Epson also offers a matched set, consisting of the PhotoPC 600 camera (\$800 street) and the Epson Stylus Photo printer (\$500). Here again, the printer and camera are calibrated to each other. The camera comes with Sierra Imaging's Image Expert software, which, broadly speaking, is equivalent

to Microsoft's PictureIt! More interesting is the Direct Print Kit (\$70 street), which lets you plug the camera directly into the Stylus Photo printer, and give print commands using self-explanatory menus shown on the camera's LCD. In our tests, the colors came out reasonably well, and the 1,024 by 768 camera resolution is adequate for pictures as large as 8 by 10 inches. (Epson America Inc., Torrance, CA; 800-463-7766, 310-782-0770; [www.epson.com](http://www.epson.com). Circle 474 on reader service card.)—M. David Stone



for photograph image editing; PrintPaks' Awesome Iron-ons with T-shirt transfer paper; and Corel's Print House Select 1.1 for creating cards, notes, and invitations.

This model's greatest visible benefit was in printing photo images, especially on the special photo paper, where the extra color blending added realism. Scores on our speed tests were on a par with other printers. The 694C's features are a step up from the 672C; it is a well-tailored device for family-oriented users.

## DESKJET 722C: THE HP YOU WANT

The real showcase model in HP's home-oriented product line is the DeskJet 722C, our Editors' Choice for home users. It brings several new technologies, some of which were developed in conjunction with other major companies, to

this market for the first time. This model will certainly exceed many of the expectations of general home users.

The 722C uses newly designed color cartridges with PhotoREt II, a technology that helps produce more ink drops per pixel in a single pass. It also includes ColorSmart II, which incorporates three new technologies to optimize color printing further. These include RGB, a color-matching standard codeveloped with Microsoft; Intel MMX driver support for faster processing; and SmartFocus to improve low-resolution images from the Internet. The printer also uses a Kodak Image Enhancement (KIE) driver to create breathtakingly clear photo images on HP's new Deluxe Photo Paper (\$14.99 for 20 sheets), which the company codeveloped with Kodak. The 722C is bundled with Corel's Print

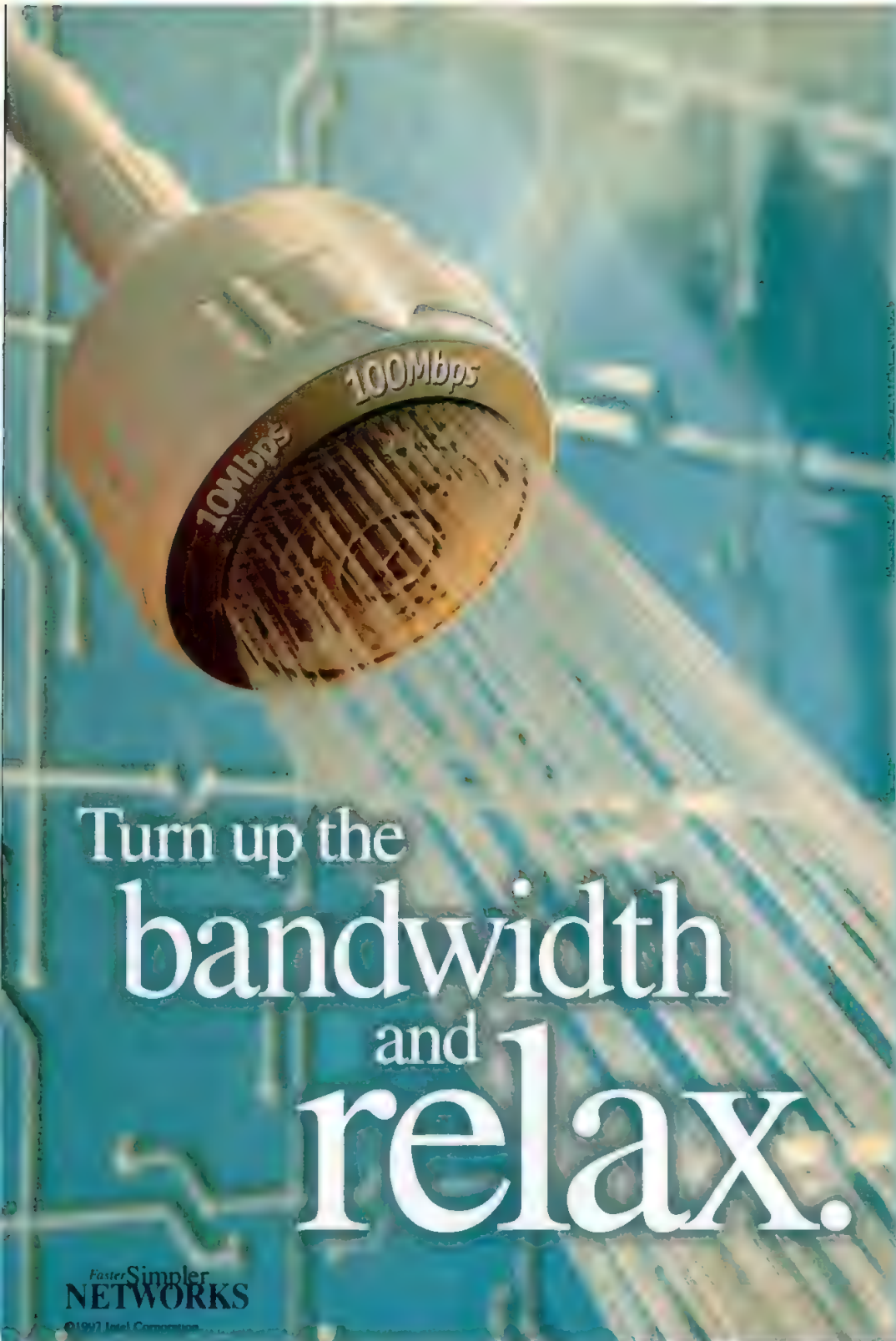
House and Photo House Select 2.0, and with Streetwise by Design 4.0.

In subjective quality testing, the 722C produced rich, vivid, consistent colors that were clearly a big step up from the DeskJet 694C in all print modes. Photos on the special photo paper were stunning. Printer speed testing was fast in Microsoft Word but slower in other applications. If you're looking for a home printer with a wealth of software and outstanding photo output, this is the one to consider.

## DESKJET 890CSE: BUSINESS BENT

The DeskJet 890Cse is a fast, network-ready machine targeted at office and professional users. For most business purposes, it is a competent and attractively priced solution. The unit shares many of the DeskJet 722C's new technologies but





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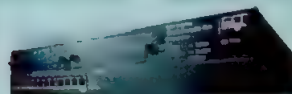
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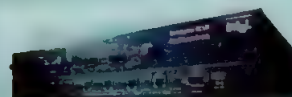
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- Microsoft® Office 97 Small Business Edition plus Encarta 97
- MS Windows® 95/Internet Explorer
- MS IntelliMouse
- 3 Yr Ltd Warranty† w/1 Year On-site³ Service

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- 512KB Single Bank Pipeline Burst Cache
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- STB Nitro 4MB EDO PCI Video Card
- 24X Max\* Variable CD-ROM Drive
- Sound Blaster 16 WaveSynth Wavetable Sound
- Altec Lansing ACS-90 Speakers
- NEW 56K Capable\*\* U.S. Robotics x2 WinModem
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- 24X Max\* Variable CD-ROM Drive
- Integrated Yamaha Wavetable Sound
- Altec Lansing ACS-490 Full Dolby Surround Sound Speakers with Subwoofer
- NEW 56K Capable\*\* U.S. Robotics x2 WinModem
- Iomega Zip 100MB Internal Drive
- Microsoft Home Essentials plus Best of Entertainment Pack
- MS Windows 95/Internet Explorer
- MS IntelliMouse
- 3 Yr Ltd Warranty† w/1 Year On-site³ Service

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Order Code #501014

## DELL DIMENSION M200n 200MHz PENTIUM® PROCESSOR WITH MMX TECHNOLOGY

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- 512KB Single Bank Pipeline Burst Cache
- 4.3GB Hard Drive (9.5ms)
- 800HS Trinitron Monitor (13.7" v.i.s., .26dp)
- 2MB EDO VERGE 3D Video
- 24X Max\* Variable CD-ROM Drive
- Sound Blaster 16 PnP Sound Card
- Altec Lansing ACS-90 Speakers
- NEW 56K Capable\*\* U.S. Robotics x2 WinModem
- MS Home Essentials plus Best of Entertainment Pack
- MS Windows 95 Internet Explorer
- MS Mouse
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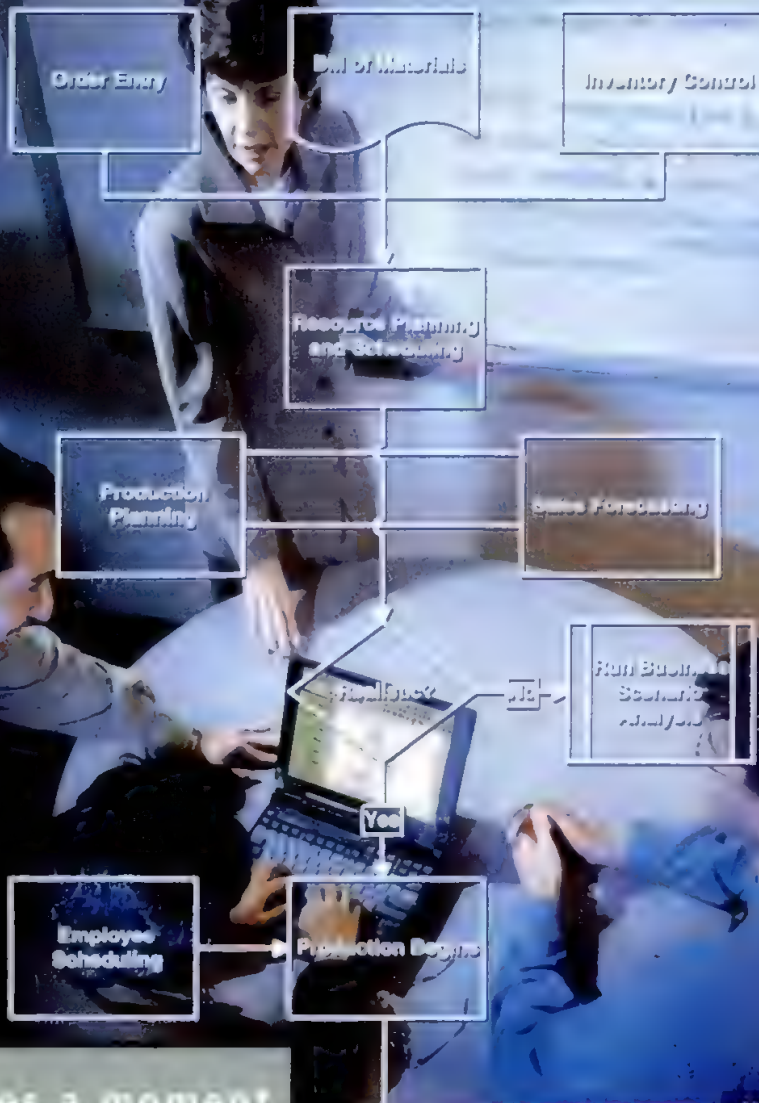
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Flowcharts





adds a 24-MHz RISC processor for higher speed printing. It is compatible with Windows 3.x, Windows 95, Windows NT 4.0, and DOS, and it comes with Publish by Design for producing brochures, letterhead, and other business materials.

Output quality was similar to the 722C's, with excellent text, color, and photo images, particularly on the special HP/Kodak photo paper. The speed enhancements paid off on all printing tasks and were especially noticeable in the Photoshop test—the 890Cse posted the fastest Photoshop score in this roundup. A respectable performer stocked with appealing features, the DeskJet 890Cse may be a serious contender for your office.

#### DESKJET 1000CSE: BIG FOR BUSINESS

The HP DeskJet 1000Cse is similar to the DeskJet 890Cse, but it can also print tabloid-size (11- by 17-inch) images. It is targeted at general office users who need a large-format printer for color spreadsheets and other documents.

The 1000Cse uses the RealLife Imaging System, which includes HP's Colorsmart and C-REt for color blending and layering. The unit also boasts low operating costs (4 cents per page for 5 percent black coverage and 8 cents per page for 15 percent color coverage). Print quality was very good

heavy-duty, connected commercial environments, it has the durability and range of features that this market requires.

The 1600CM is PostScript-compatible and comes with an HP JetDirect board with LocalTalk, 10Base-T, and BNC network connectors. The printer ships with 6MB of memory, which is expandable via standard SIMMs to 70MB. It can work with MS-DOS, Windows, OS/2, and Macintosh System 6.0.7 and above, as well as HP-UX, SunOS, and Solaris SCO Unix workstations. Per-page printing costs are extremely low, at 1.5 cents for black output with 5 percent coverage and 3.3 cents for color output with 15 percent coverage.

The 1600CM was one of the fastest performers in the roundup, topping the charts on our Microsoft Word and Freelance Graphics tests. Output quality, however, was uneven. Text output looked good, but this model couldn't compete in gray-scale and color output with newer ink jets from HP and others. Still, it's in a class by itself. A little updating will make this workhorse a winner again.

#### PHOTOSMART: PERSONAL DARKROOM

If you're intrigued by digital photography, if you scan regular photos, or if you download photo image files from the Web, then consider the HP Photosmart printer. Marketed specifically for photo printing, it's a reasonable choice if you won't be needing the unit for other printing tasks. The unit includes PictureIt! image editing software and HP's Photosmart software, which ties the printer to the HP's Photosmart scanner and Photosmart digital camera (see the sidebar "Snap, Scan, Print: Putting the Pieces Together").

The large-footprint Photosmart has two three-color ink cartridges for six-color printing. There is no dedicated black, so black tones are uneven and only marginally acceptable for many uses. Photo output on regular paper is more than respectable, but ordinary color graphics printing resulted in unexpected colors and tones. Yet the quality of all printouts improves dramatically when you use HP's heavyweight Photosmart Glossy Photographic Paper (\$18.95 for 20 8.5- by 11-inch sheets); in our subjective tests the

results for this paper were stunning.

Predictably, this one-trick pony was a bit slower than average on our speed tests. But if you want to print photos, it's a solid choice.—BB

**Hewlett-Packard Co.**, Palo Alto, CA; 800-752-0900, 208-323-2551; [www.hp.com](http://www.hp.com).  
Circle 475 on reader service card.



## Zenographics' SuperPrint

**Z**enographics claims that its SuperPrint 5.01 utility (\$50 street) can boost the output quality and print speed for most printers, color or monochrome. Intrigued by the idea of getting even better photo output from the new crop of ink jets in this review, we put a late beta version of the software to the test.

We did see an improvement in output quality with the Epson Stylus Color 600 we tested, though not in every case. On some images, the SuperPrint-enhanced output did indeed offer far more realistic color for skin tones than the Epson driver. With another 8- by 10-inch image, however, the standard Epson driver delivered better output and faster print speed.

Zenographics notes that its drivers will help most on images with less-than-ideal resolution, so if you have a digital camera or print images from the Web, you should see more consistent improvement. All in all, if you print a lot of images, SuperPrint is certainly worth having in your arsenal. (Zenographics Inc., Irvine, CA; 800-566-7468; 714-851-6352; [www.zenocom.com](http://www.zenocom.com).) Circle 487 on reader service card.—MDS



HP's PHOTOSMART is available separately or bundled with a scanner and a digital camera.

overall except for some banding in large color areas. The unit also did well on our speed tests. The 1000Cse is an excellent, inexpensive, versatile business printer.

#### DESKJET 1600CM: NETWORK-READY

For professional-level, network-ready printing in a large office, the DeskJet 1600CM will surely satisfy. Designed for



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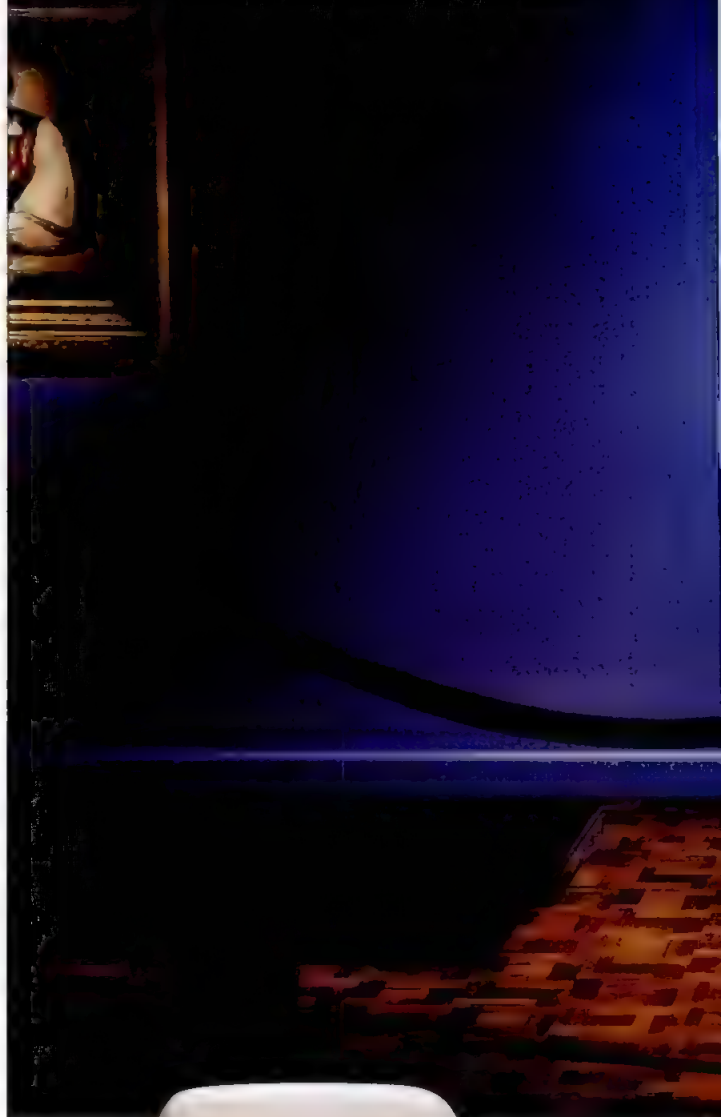


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SUMMARY OF FEATURES

# Ink Jet Printers

■ YES ■ NO □ OPTIONAL

Products listed in alphabetical order

|                                             | Alps MD-1000                            | Apple Color<br>StyleWriter<br>6500                                                         | Canon BJC-80                                   | Canon BJC-250                                  | Canon<br>BJC-4304<br>Photo                     | Canon BJC-620                                  | Canon<br>BJC-7000                              | Epson Stylus<br>Color 400                     |
|---------------------------------------------|-----------------------------------------|--------------------------------------------------------------------------------------------|------------------------------------------------|------------------------------------------------|------------------------------------------------|------------------------------------------------|------------------------------------------------|-----------------------------------------------|
| Street price                                | \$350                                   | \$450                                                                                      | \$300                                          | \$150                                          | \$240                                          | \$300                                          | \$450                                          | \$200                                         |
| Dimensions (HWD, in inches)                 | 7.5 x 17.4 x 11.0                       | 6.9 x 17.5 x 15.6                                                                          | 2.2 x 11.8 x 6.2                               | 6.8 x 14.2 x 8.5                               | 7.5 x 15.1 x 11.5                              | 7.2 x 16.1 x 10.0                              | 8.6 x 18.3 x 13.5                              | 6.1 x 16.9 x 9.1                              |
| Weight (pounds)                             | 9.7                                     | 14.3                                                                                       | 3.1                                            | 5.5                                            | 7.7                                            | 9.9                                            | 13.1                                           | 11.5                                          |
| Rated monochrome/color speed (ppm)          | 2 / 2.5                                 | 7 / 2                                                                                      | 4 / 0.5                                        | 5 / 2                                          | 5 / 2                                          | 3 / 1.7                                        | 5 / 3.5                                        | 4 / 3                                         |
| Number of colors used in printing           | 4                                       | 4                                                                                          | 4                                              | 3                                              | 4                                              | 4                                              | 7                                              | 4                                             |
| Number of black/color jets                  | N/A*                                    | 300 / 192                                                                                  | 64 / 72                                        | 64 / 48                                        | 128 / 72                                       | 64 / 192                                       | 608 / 480                                      | 64 / 63                                       |
| Maximum monochrome resolution (dpi)         | 1,200 x 600                             | 600 x 600                                                                                  | 720 x 360                                      | 720 x 360                                      | 720 x 360                                      | 720 x 720                                      | 1,200 x 600                                    | 720 x 720                                     |
| Maximum color graphics resolution (dpi)     | 1,200 x 600                             | 600 x 300                                                                                  | 720 x 360                                      | 360 x 360                                      | 720 x 360                                      | 720 x 720                                      | 1,200 x 600                                    | 720 x 720                                     |
| Parallel port/serial port                   | ■ ■                                     | ■ ■                                                                                        | ■ ■                                            | ■ ■                                            | ■ ■                                            | ■ ■                                            | ■ ■                                            | ■ ■                                           |
| Prints from OSs other than Windows          | ■                                       | ■                                                                                          | ■                                              | ■                                              | ■                                              | ■                                              | ■                                              | ■                                             |
| Prints from DOS box in Windows              | ■                                       | N/A**                                                                                      | ■                                              | ■                                              | ■                                              | ■                                              | ■                                              | ■                                             |
| Printer description language                | None                                    | PCL 3                                                                                      | None                                           | None                                           | None                                           | None                                           | None                                           | ESC/P2                                        |
| Macintosh-compatible                        | ■                                       | ■                                                                                          | ■                                              | ■                                              | ■                                              | ■                                              | ■                                              | ■                                             |
| <b>Paper Handling and Inks</b>              |                                         |                                                                                            |                                                |                                                |                                                |                                                |                                                |                                               |
| Input/output tray capacity (sheets)         | 100 / 100                               | 150 / 50                                                                                   | 30 / 30                                        | 100 / 100                                      | 100 / 100                                      | 100 / 100                                      | 130 / 130                                      | 100 / 30                                      |
| Envelope input capacity/Heaviest paper      | 1 / 110 lbs.                            | 15 / 36 lbs.                                                                               | 5 / 38 lbs.                                    | 15 / 28 lbs.                                   | 15 / 30 lbs.                                   | 15 / 28 lbs.                                   | 15 / 157 lbs.                                  | 10 / 24 lbs.                                  |
| Prints on card stock/transparencies         | ■ ■                                     | ■ ■                                                                                        | ■ ■                                            | ■ ■                                            | ■ ■                                            | ■ ■                                            | ■ ■                                            | ■ ■                                           |
| Prints T-shirt transfers                    | ■                                       | ■                                                                                          | ■                                              | ■                                              | ■                                              | ■                                              | ■                                              | ■                                             |
| Prints on legal-size/tabloid-size paper     | ■ ■                                     | ■ ■                                                                                        | ■ ■                                            | ■ ■                                            | ■ ■                                            | ■ ■                                            | ■ ■                                            | ■ ■                                           |
| Maximum banner length (inches)              | N/A*                                    | N/A*                                                                                       | N/A*                                           | 66                                             | 66                                             | N/A*                                           | N/A*                                           | 44                                            |
| Cost of high-capacity black ink cartridge   | \$6.99                                  | \$28.80                                                                                    | \$17.25                                        | \$24.25                                        | \$28.48                                        | \$12.98                                        | \$37.50                                        | \$23.50                                       |
| Cost of color cartridge                     | \$6.99                                  | \$30.15                                                                                    | \$22.43                                        | \$33.68                                        | \$20.84                                        | \$7.94                                         | \$35.00                                        | \$27.26                                       |
| Separate cartridge for each color           | ■                                       | ■                                                                                          | ■                                              | ■                                              | ■                                              | ■                                              | ■                                              | ■                                             |
| Low-ink/out-of-ink alert                    | ■ ■                                     | ■ ■                                                                                        | ■ ■                                            | ■ ■                                            | ■ ■                                            | ■ ■                                            | ■ ■                                            | ■ ■                                           |
| Stops printing if one color runs out        | ■                                       | ■                                                                                          | ■                                              | ■                                              | ■                                              | ■                                              | ■                                              | ■                                             |
| Photo ink available                         | ■                                       | ■                                                                                          | ■                                              | ■                                              | ■                                              | ■                                              | ■                                              | ■                                             |
| Water-/fade-resistant inks                  | ■ ■                                     | ■ ■                                                                                        | ■ ■                                            | ■ ■                                            | ■ ■                                            | ■ ■                                            | ■ ■                                            | ■ ■                                           |
| Estimated cost per page: 5% black coverage  | 3.5 cents                               | 3.3 cents                                                                                  | 3 cents                                        | 5 cents                                        | 3 cents                                        | 2 cents                                        | 4 cents                                        | 4 cents                                       |
| Estimated cost per page: 15% color coverage | 13.8 cents                              | 7.7 cents                                                                                  | 16 cents                                       | 11 cents                                       | 14 cents                                       | 6 cents                                        | 10 cents                                       | 9 cents                                       |
| <b>Software and Support</b>                 |                                         |                                                                                            |                                                |                                                |                                                |                                                |                                                |                                               |
| Driver for Windows 3.1/95/NT                | ■ ■ ■                                   | ■ ■ ■                                                                                      | ■ ■ ■                                          | ■ ■ ■                                          | ■ ■ ■                                          | ■ ■ ■                                          | ■ ■ ■                                          | ■ ■ ■                                         |
| Driver for OS/2 / Mac OS                    | ■ ■                                     | ■ ■                                                                                        | ■ ■                                            | ■ ■                                            | ■ ■                                            | ■ ■                                            | ■ ■                                            | ■ ■                                           |
| Application software included               | Hanes T-Shirt<br>Maker, Print<br>Artist | Now Up-To-Date/<br>Contact, Personal<br>Record Keeper,<br>PrintMaster Gold,<br>Stencil It! | None                                           | Canon Creative 3<br>Web Record                 | Canon Creative 3<br>Web Record                 | Canon Creative 3<br>Web Record                 | Canon Creative 3<br>Web Record                 | Adobe Photo<br>Deluxe, Sierra<br>Print Artist |
| Toll-free technical support                 | ■                                       | ■                                                                                          | ■                                              | ■                                              | ■                                              | ■                                              | ■                                              | ■                                             |
| Technical-support hours (eastern time)      | 11:00-8:00 M-F                          | 9:00-9:00 M-F                                                                              | 8:00 A.M.-10:00<br>P.M. M-F,<br>noon-6:00 Sat. | 8:00 A.M.-10:00<br>P.M. M-F,<br>noon-6:00 Sat. | 8:00 A.M.-10:00<br>P.M. M-F,<br>noon-6:00 Sat. | 8:00 A.M.-10:00<br>P.M. M-F,<br>noon-6:00 Sat. | 8:00 A.M.-10:00<br>P.M. M-F,<br>noon-6:00 Sat. | 9:00-9:00 M-F,<br>9:00-7:00 Sat.,<br>Sun.     |
| Warranty                                    | 1 year                                  | 1 year                                                                                     | 1 year                                         | 1 year                                         | 1 year                                         | 1 year                                         | 1 year                                         | 1 year                                        |
| Overnight exchange under warranty           | ■                                       | ■                                                                                          | ■                                              | ■                                              | ■                                              | ■                                              | ■                                              | ■                                             |
| Web address                                 | www.alpsusa.com                         | www.imaging.apple.com                                                                      | www.ccsi.canon.com                             | www.ccsi.canon.com                             | www.ccsi.canon.com                             | www.ccsi.canon.com                             | www.ccsi.canon.com                             | www.epson.com                                 |

N/A\*—Not applicable: The product does not have this feature.

N/A\*\*—Not applicable: This printer can print natively from DOS.

## Lexmark Color Jetprinter 1000, 2030, 3000, 7000

COLOR JETPRINTER 1000: Legal-size 3-color ink jet. Monochrome: 3.5 ppm, 600 dpi. Color: 1.5 ppm, 600 dpi. Windows only. \$140 street.

COLOR JETPRINTER 2030: Legal-size 4-color ink jet. Monochrome: 3 ppm, 600 by 300 dpi. Color: 1 ppm, 600 by 300 dpi. Windows only. \$180 street.

COLOR JETPRINTER 3000: Legal-size 4-color ink jet. Monochrome: 4 ppm, 600 by 300 dpi. Color: 1.5

ppm, 600 by 300 dpi. \$250 street.

COLOR JETPRINTER 7000: Legal-size 4-color ink jet. Monochrome: 8 ppm, 1,200 dpi. Color: 3 ppm, 1,200 dpi. Windows only. \$400 street.

Better known for its award-winning network and standalone laser printers, Lexmark is trying to get more recognition in an ink jet market saturated by Canon, Epson, and Hewlett-Packard. Like these competitors, Lexmark has an offering for every market segment, from students to

business users. While none of Lexmark's four entries are standouts, they are competitively priced printers worthy of your attention.

The Lexmark printers we tested feature waterproof and smearproof black ink, and have convenient read-outs showing both print status and ink cartridge status. The Color Jetprinter 2030 and 7000 also come bundled with two CD-ROMs filled with a variety of applications, pro-

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| Epson Stylus Color 800                           | Epson Stylus Color 800                           | Epson Stylus Photo                               | Epson Stylus Color 1520                          | HP DeskJet 400L                            | HP DeskJet 672C                            | HP DeskJet 694C                                                  | HP DeskJet 722C                                               | HP DeskJet 890C                            | HP DeskJet 1000Cee                                    |
|--------------------------------------------------|--------------------------------------------------|--------------------------------------------------|--------------------------------------------------|--------------------------------------------|--------------------------------------------|------------------------------------------------------------------|---------------------------------------------------------------|--------------------------------------------|-------------------------------------------------------|
| \$300                                            | \$400                                            | \$500                                            | \$800                                            | \$150                                      | \$200                                      | \$300                                                            | \$350                                                         | \$450                                      | \$500                                                 |
| 6.1 x 16.9 x 9.1                                 | 7.0 x 16.7 x 10.8                                | 6.4 x 16.9 x 9.2                                 | 8.0 x 26.0 x 20.0                                | 7.0 x 13.7 x 6.4                           | 7.9 x 17.2 x 16.0                          | 7.9 x 17.2 x 16.0                                                | 7.2 x 17.5 x 14.0                                             | 8.9 x 17.5 x 15.6                          | 8.8 x 22.8 x 26.1                                     |
| 11.5                                             | 14.3                                             | 11.5                                             | 25.5                                             | 6.8                                        | 11.8                                       | 11.6                                                             | 12.0                                                          | 14.3                                       | 20.7                                                  |
| 6/4                                              | 6/7                                              | Info not available                               | 6/5                                              | 2/0.5                                      | 4/1.5                                      | 5/1.7                                                            | 8/4                                                           | 9/5                                        | 6/3.5                                                 |
| 4                                                | 4                                                | 8                                                | 4                                                | 3                                          | 4                                          | 4 (photo mode, 6)                                                | 4                                                             | 4                                          | 4                                                     |
| 84/96                                            | 128/192                                          | 32/180                                           | 128/192                                          | 50/48                                      | 48/48                                      | 48/48                                                            | 300/192                                                       | 300/192                                    | 48/48                                                 |
| 1,440 x 720                                      | 1,440 x 720                                      | 720 x 720                                        | 1,440 x 720                                      | 600 x 300                                  | 600 x 600                                  | 600 x 600                                                        | 600                                                           | 600                                        | 600                                                   |
| 1,440 x 720                                      | 1,440 x 720                                      | 720 x 720                                        | 1,440 x 720                                      | 300 x 300                                  | 600 x 300                                  | 600 x 300                                                        | Info not available                                            | Info not available                         | 600                                                   |
| ■ ■                                              | ■ ■                                              | ■ ■                                              | ■ ■                                              | ■ ■                                        | ■ ■                                        | ■ ■                                                              | ■ ■                                                           | ■ ■                                        | ■ ■                                                   |
| ■ ■                                              | ■ ■                                              | ■ ■                                              | ■ ■                                              | ■ ■                                        | ■ ■                                        | ■ ■                                                              | ■ ■                                                           | ■ ■                                        | ■ ■                                                   |
| N/A**                                            | N/A**                                            | N/A**                                            | N/A**                                            | N/A**                                      | N/A**                                      | N/A**                                                            | ■ ■                                                           | N/A**                                      | ■ ■                                                   |
| ESC/P2                                           | ESC/P2                                           | ESC/P2                                           | ESC/P2                                           | PCL 3                                      | PCL 3                                      | PCL 3                                                            | HP PPA                                                        | PCL 3 Enhanced                             | HP PPA                                                |
| ■                                                | ■                                                | ■                                                | ■                                                | ■                                          | ■                                          | ■                                                                | ■                                                             | ■                                          | ■                                                     |
| 100/30                                           | 100/30                                           | 100/30                                           | 100/30                                           | 50/10                                      | 100/50                                     | 100/50                                                           | 100/50                                                        | 150/50                                     | 150/50                                                |
| 10/24 lbs.                                       | 10/24 lbs.                                       | 10/24 lbs.                                       | 10/24 lbs.                                       | 1/110 lbs.                                 | 20/110 lbs.                                | 20/110 lbs.                                                      | 15/110 lbs.                                                   | 15/36 lbs.                                 | 15/36 lbs.                                            |
| ■ ■                                              | ■ ■                                              | ■ ■                                              | ■ ■                                              | ■ ■                                        | ■ ■                                        | ■ ■                                                              | ■ ■                                                           | ■ ■                                        | ■ ■                                                   |
| ■ ■                                              | ■ ■                                              | ■ ■                                              | ■ ■                                              | ■ ■                                        | ■ ■                                        | ■ ■                                                              | ■ ■                                                           | ■ ■                                        | ■ ■                                                   |
| ■ ■                                              | ■ ■                                              | ■ ■                                              | ■ ■                                              | ■ ■                                        | ■ ■                                        | ■ ■                                                              | ■ ■                                                           | ■ ■                                        | ■ ■                                                   |
| 44                                               | 44                                               | 44                                               | 44                                               | N/A*                                       | N/A*                                       | 55                                                               | 55                                                            | N/A*                                       | 55                                                    |
| \$23.50                                          | \$27.26                                          | \$23.50                                          | \$27.26                                          | \$32.95                                    | \$32.95                                    | \$32.95                                                          | \$32.95                                                       | \$32.95                                    | \$32.95                                               |
| \$27.26                                          | \$27.26                                          | \$23.50                                          | \$27.26                                          | \$34.95                                    | \$34.95                                    | \$34.95; photo, \$39.95                                          | \$39.95                                                       | \$39.95                                    | \$34.95                                               |
| ■                                                | ■                                                | ■                                                | ■                                                | ■                                          | ■                                          | ■                                                                | ■                                                             | ■                                          | ■                                                     |
| ■ ■                                              | ■ ■                                              | ■ ■                                              | ■ ■                                              | ■ ■                                        | ■ ■                                        | ■ ■                                                              | ■ ■                                                           | ■ ■                                        | ■ ■                                                   |
| ■                                                | ■                                                | ■                                                | ■                                                | ■                                          | ■                                          | ■                                                                | ■                                                             | ■                                          | ■                                                     |
| ■                                                | ■                                                | ■ (included)                                     | ■                                                | ■                                          | ■                                          | ■                                                                | ■                                                             | ■                                          | ■                                                     |
| ■ ■                                              | ■ ■                                              | ■ ■                                              | ■ ■                                              | ■ ■                                        | ■ ■                                        | ■ ■                                                              | ■ ■                                                           | ■ ■                                        | ■ ■                                                   |
| 5 cents                                          | 3 cents                                          | 4 cents                                          | 3 cents                                          | 3 cents                                    | 4 cents                                    | 4 cents                                                          | 3 cents                                                       | 3 cents                                    | 4 cents                                               |
| 8 cents                                          | 9 cents                                          | 15 cents                                         | 9 cents                                          | 23 cents                                   | 10 cents                                   | 10 cents                                                         | 9 cents                                                       | 9 cents                                    | 8 cents                                               |
| ■ ■ ■                                            | ■ ■ ■                                            | ■ ■ ■                                            | ■ ■ ■                                            | ■ ■ ■                                      | ■ ■ ■                                      | ■ ■ ■                                                            | ■ ■ ■                                                         | ■ ■ ■                                      | ■ ■ ■                                                 |
| ■ ■ ■                                            | ■ ■ ■                                            | ■ ■ ■                                            | ■ ■ ■                                            | ■ ■ ■                                      | ■ ■ ■                                      | ■ ■ ■                                                            | ■ ■ ■                                                         | ■ ■ ■                                      | ■ ■ ■                                                 |
| Adobe Photo Deluxe, Sierra Print Artist          | None                                             | LivePix                                          | None                                             | None                                       | PrintPaks Pop-Up Greetings                 | Corel PrintHouse Select 1.1, PrintPaks Iron-Ons, Storm EasyPhoto | byDesign, MS Internet Explorer, Print & Photohouse Select 4.0 | iPublish                                   | Corel PrintHouse Select 1.1, HP ZoomSmart, mySoftware |
| ■                                                | ■                                                | ■                                                | ■                                                | ■                                          | ■                                          | ■                                                                | ■                                                             | ■                                          | ■                                                     |
| 9:00-9:00 M-F, 9:00-7:00 Sat., Sun.              | 9:00-9:00 M-F, 9:00-7:00 Sat., Sun.              | 9:00-9:00 M-F, 9:00-7:00 Sat., Sun.              | 9:00-9:00 M-F, 9:00-7:00 Sat., Sun.              | 11:00 A.M.-midnight M-F, noon-7:00 Sat.    | 11:00 A.M.-midnight M-F, noon-7:00 Sat.    | 11:00 A.M.-midnight M-F, noon-7:00 Sat.                          | 11:00 A.M.-midnight M-F, noon-7:00 Sat.                       | 11:00 A.M.-midnight M-F, noon-7:00 Sat.    | 11:00 A.M.-midnight M-F, noon-7:00 Sat.               |
| 1 year                                           | 1 year                                           | 1 year                                           | 1 year                                           | 1 year                                     | 1 year                                     | 1 year                                                           | 1 year                                                        | 1 year                                     | 1 year                                                |
| ■                                                | ■                                                | ■                                                | ■                                                | ■                                          | ■                                          | ■                                                                | ■                                                             | ■                                          | ■                                                     |
| <a href="http://www.epson.com">www.epson.com</a> | <a href="http://www.epson.com">www.epson.com</a> | <a href="http://www.epson.com">www.epson.com</a> | <a href="http://www.epson.com">www.epson.com</a> | <a href="http://www.hp.com">www.hp.com</a> | <a href="http://www.hp.com">www.hp.com</a> | <a href="http://www.hp.com">www.hp.com</a>                       | <a href="http://www.hp.com">www.hp.com</a>                    | <a href="http://www.hp.com">www.hp.com</a> | <a href="http://www.hp.com">www.hp.com</a>            |

jects, and utilities. Finally, each of these printers has an one-year LexExpress warranty that promises a free replacement within 24 hours if your printer fails.

#### JETPRINTER 1000: CHEAP AND GOOD

The Color Jetprinter 1000 is the least expensive printer in this roundup and will appeal to home users, students, or anyone on a tight budget. The 1000 uses only one cartridge at a time, either a black-ink

cartridge (which is not included in the box) or a 3-in-1 CMY cartridge (included). During our testing the unit had significant paper feed problems, either passing two or three sheets through the feeder at the same time or refusing to feed any paper through it at all. After heavy use, the print head also begins smearing and needs to be cleaned.

When the 1000 was less heavily taxed, its output rivaled that of much more ex-

pensive devices, offering pleasing skin tones, and bright, consistent colors. Type was crisp and black, and color gradients were generally smooth with no significant banding. On speed tests, monochrome printing was average or even a little faster than that of the other units. Color printing was slower but not alarmingly so. All in all, the Color Jetprinter 1000 is a good buy for monochrome text and light-duty color printing.



**SUMMARY OF FEATURES**

See [www.pcmag.com](http://www.pcmag.com) for interactive views

# Ink Jet Printers

■ YES ■ NO □ OPTIONAL

Products listed in alphabetical order

|                                             | HP Photosmart                                                          | HP DeskJet 1600CM                          | Lexmark Color Jetprinter 1000                        | Lexmark Color Jetprinter 2030                        | Lexmark Color Jetprinter 3000                        | Lexmark Color Jetprinter 7000                        | Olivetti JP 90                                         |
|---------------------------------------------|------------------------------------------------------------------------|--------------------------------------------|------------------------------------------------------|------------------------------------------------------|------------------------------------------------------|------------------------------------------------------|--------------------------------------------------------|
| Street price                                | \$500                                                                  | \$2,000                                    | \$140                                                | \$180                                                | \$250                                                | \$400                                                | \$250                                                  |
| Dimensions (HWD, in inches)                 | 6.1 x 18.0 x 17.8                                                      | 11.0 x 20.0 x 17.0                         | 6.0 x 14.2 x 6.3                                     | 7.4 x 18.2 x 9.4                                     | 7.1 x 17.9 x 8.4                                     | 12.0 x 17.0 x 10.5                                   | 2.8 x 3.8 x 5.3                                        |
| Weight (pounds)                             | 20.0                                                                   | 25.0                                       | 5.0                                                  | 9.5                                                  | 9.5                                                  | 9.5                                                  | 2.4                                                    |
| Rated monochrome/color speed (ppm)          | Info not available                                                     | 9 / 4                                      | 3.5 / 1.5                                            | 3 / 1                                                | 4 / 1.5                                              | 8 / 3                                                | 3 / 0.3                                                |
| Number of colors used in printing           | 6                                                                      | 4                                          | 3                                                    | 4                                                    | 4                                                    | 4                                                    | 3                                                      |
| Number of black/color jets                  | Info not available                                                     | 300 / 104                                  | 56 / 48                                              | 56 / 48                                              | 56 / 48                                              | 192 / 208                                            | 50 / 51                                                |
| Maximum monochrome resolution (dpi)         | Info not available                                                     | 600                                        | 600 x 600                                            | 600 x 300                                            | 600 x 300                                            | 1,200 x 1,200                                        | 600 x 300                                              |
| Maximum color graphics resolution (dpi)     | Info not available                                                     | 600                                        | 600 x 600                                            | 600 x 300                                            | 600 x 300                                            | 1,200 x 1,200                                        | 300 x 300                                              |
| Parallel port/serial port                   | ■ ■                                                                    | ■ ■                                        | ■ ■                                                  | ■ ■                                                  | ■ ■                                                  | ■ ■                                                  | ■ ■                                                    |
| Prints from OSs other than Windows          | ■                                                                      | ■                                          | ■                                                    | ■                                                    | ■                                                    | ■                                                    | ■                                                      |
| Prints from DOS box in Windows              | ■                                                                      | N/A**                                      | ■                                                    | ■                                                    | N/A**                                                | ■                                                    | N/A**                                                  |
| Printer description language                | HP IPCL                                                                | PCL 5 Enhanced                             | None                                                 | None                                                 | None                                                 | None                                                 | PCL 3                                                  |
| Macintosh-compatible                        | ■                                                                      | ■                                          | ■                                                    | ■                                                    | ■                                                    | ■                                                    | ■                                                      |
| <b>Paper Handling and Inks</b>              |                                                                        |                                            |                                                      |                                                      |                                                      |                                                      |                                                        |
| Input/output tray capacity (sheets)         | 40 / 40                                                                | 180 / 100                                  | 30 / None                                            | 106 / None                                           | 100 / 25                                             | 150 / None                                           | 15 / 5                                                 |
| Envelope input capacity/Heaviest paper      | N/A* / Photo-grade                                                     | 1 / 24 lbs.                                | 1 / 24 lbs.                                          | 1 / 24 lbs.                                          | 1 / 24 lbs.                                          | 15 / 24 lbs.                                         | 1 / 110 lbs.                                           |
| Prints on card stock/transparencies         | ■ ■                                                                    | ■ ■                                        | ■ ■                                                  | ■ ■                                                  | ■ ■                                                  | ■ ■                                                  | ■ ■                                                    |
| Prints T-shirt transfers                    | ■                                                                      | ■                                          | ■                                                    | ■                                                    | ■                                                    | ■                                                    | ■                                                      |
| Prints on legal-size/tabloid-size paper     | ■ ■                                                                    | ■ ■                                        | ■ ■                                                  | ■ ■                                                  | ■ ■                                                  | ■ ■                                                  | ■ ■                                                    |
| Maximum banner length (inches)              | N/A*                                                                   | N/A*                                       | N/A*                                                 | N/A*                                                 | N/A*                                                 | N/A*                                                 | 48                                                     |
| Cost of high-capacity black ink cartridge   | N/A*                                                                   | \$32.95                                    | \$39.95                                              | \$34.95                                              | \$34.95                                              | \$32.95                                              | \$31.95                                                |
| Cost of color cartridge                     | \$39.95                                                                | \$34.95                                    | \$36.99                                              | \$38.95                                              | \$38.95                                              | \$38.95                                              | \$52.95                                                |
| Separate cartridge for each color           | ■                                                                      | ■                                          | ■                                                    | ■                                                    | ■                                                    | ■                                                    | ■                                                      |
| Low-ink/out-of-ink alert                    | ■ ■                                                                    | ■ ■                                        | ■ ■                                                  | ■ ■                                                  | ■ ■                                                  | ■ ■                                                  | ■ ■                                                    |
| Stops printing if one color runs out        | ■                                                                      | ■                                          | ■                                                    | ■                                                    | ■                                                    | ■                                                    | ■                                                      |
| Photo ink available                         | ■ (included)                                                           | ■                                          | ■                                                    | ■                                                    | ■                                                    | ■                                                    | ■                                                      |
| Water-/fade-resistant inks                  | ■ ■                                                                    | ■ ■                                        | ■ ■ (black only)                                     | ■ ■ (black only)                                     | ■ ■ (black only)                                     | ■ ■ (black only)                                     | ■ ■                                                    |
| Estimated cost per page: 5% black coverage  | Info not available                                                     | 1.5 cents                                  | Info not available                                   | 3 cents                                              | 4 cents                                              | 3 cents                                              | 15 cents                                               |
| Estimated cost per page: 15% color coverage | Info not available                                                     | 3 cents                                    | Info not available                                   | 17 cents                                             | 17 cents                                             | 17 cents                                             | 45 cents                                               |
| <b>Software and Support</b>                 |                                                                        |                                            |                                                      |                                                      |                                                      |                                                      |                                                        |
| Driver for Windows 3.1/95/NT                | ■ ■ ■                                                                  | ■ ■ ■                                      | ■ ■ ■                                                | ■ ■ ■                                                | ■ ■ ■                                                | ■ ■ ■                                                | ■ ■ ■                                                  |
| Driver for OS/2 / Mac OS                    | ■ ■                                                                    | ■ ■                                        | ■ ■                                                  | ■ ■                                                  | ■ ■                                                  | ■ ■                                                  | ■ ■                                                    |
| Application software included               | PhotoSmart, PictureIt!                                                 | None                                       | None                                                 | Lexmark Workshop                                     | None                                                 | Lexmark Workshop, LivePix                            | None                                                   |
| Toll-free technical support                 | ■                                                                      | ■                                          | ■                                                    | ■                                                    | ■                                                    | ■                                                    | ■                                                      |
| Technical-support hours (eastern time)      | 11:00 A.M.—midnight M-F, noon–7:00 Sat.                                | 8:00 A.M.—midnight M-F, noon–7:00 Sat.     | 9:00–9:00 M-F, noon–6:00 Sat., Sun.                  | 9:00–9:00 M-F, noon–6:00 Sat., Sun.                  | 9:00–9:00 M-F, noon–6:00 Sat., Sun.                  | 9:00–9:00 M-F, noon–6:00 Sat., Sun.                  | 8:30–5:00 M-F                                          |
| Warranty                                    | 1 year                                                                 | 1 year                                     | 1 year                                               | 1 year                                               | 1 year                                               | 1 year                                               | 1 year                                                 |
| Overnight exchange under warranty           | ■                                                                      | ■                                          | ■                                                    | ■                                                    | ■                                                    | ■                                                    | ■                                                      |
| Web address                                 | <a href="http://www.hp.com/go/PhotoSmart">www.hp.com/go/PhotoSmart</a> | <a href="http://www.hp.com">www.hp.com</a> | <a href="http://www.lexmark.com">www.lexmark.com</a> | <a href="http://www.lexmark.com">www.lexmark.com</a> | <a href="http://www.lexmark.com">www.lexmark.com</a> | <a href="http://www.lexmark.com">www.lexmark.com</a> | <a href="http://www.royalnet.com">www.royalnet.com</a> |

N/A\*—Not applicable: The product does not have this feature.

N/A\*\*—Not applicable: This printer can print natively from DOS.

## JETPRINTER 2030: BETTER FEEDER

The Color Jetprinter 2030 is Lexmark's next bump up for SOHO users, supposedly featuring better color and faster output than the 1000. Generally speaking, we did not find it faster, although it did prove slightly less prone to paper and printhead problems.

Installing the 2030 is easy. The interface is robust and versatile, offering a range of parameters and presets. The printer uses a dual-cartridge system so you don't have to swap inks manually.

Although the 2030 incorporates an image-enhancing technology called Edge Sharpness, in our opinion, the output results were not as good as the 1000. Text and colors were generally good, but photographs tended to lose detail in the shadows. Gradients displayed minimal banding. What was lacking was "snap," or crisp clarity, even when outputting to glossy paper. On speed tests, the 2030 was quicker than the 1000 during monochrome printing but substantially slower during color printing.

## JETPRINTER 3000: SO CLOSE

The Color Jetprinter 3000 is a low-end business printer designed to operate on different platforms in a variety of environments. It was the most trouble-free of the Lexmark ink jets we tested, but its poky speed and limited paper-handling capability will make it unsuitable for many offices.

The 3000 uses the same interface as the 2030, offering a wide range of preset modes: automatic, photographic color, business graphics, text, graphic art, gray-

**The technology is circa 2000.**

**price is circa 2299. (Dollars)**



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- Number Nine Reality 334 PCI, 4MB SGRAM
- Altec Lansing ACS-45 Speakers
- NEC C550 15" Monitor (14" viewable)
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- Number Nine Reality 334 PCI, 4MB SGRAM
- Altec Lansing ACS-90 Speakers
- U.S. Robotics x2 56Kbps\* Capable Modem
- NEC C550 15" Monitor (14" viewable)
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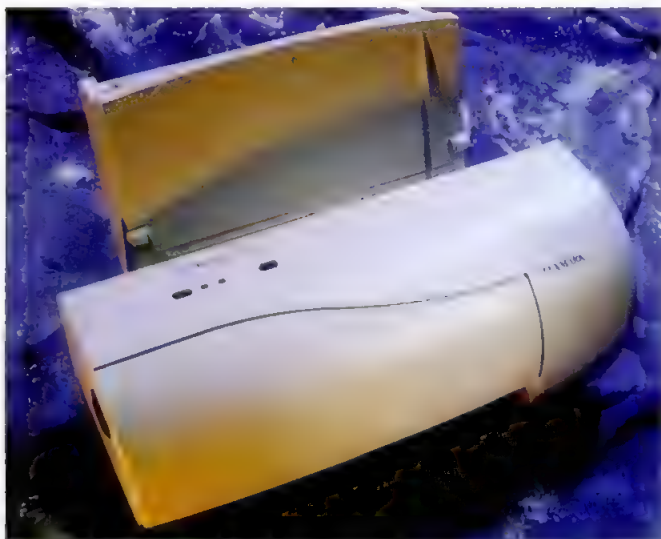
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The Lexmark Color Jetprinter 7000 produced laser-quality text, though its paper-feed mechanism needs improvement.

the 3000's paper tray is limited to only 100 sheets, the output bin can only hold 25 sheets, and envelopes, labels, and transparency media must be hand-fed singly.

Print quality, especially text and business graphics, looked very good. Solid colors were clean and consistent, and gradients were good though slightly mottled. The output speed was in a virtual dead heat with the

output, higher resolution, and more user control. But its spotty print quality and frequent propensity to misfeed paper on our tests seriously marred its appeal.

The 7000's 1,200- by 1,200-dpi resolution promises razor-sharp text and graphics, and its image-compression technology boosts output speed up to a rated 8 pages per minute. And indeed, it was the fastest Lexmark ink jet on all but one of our speed tests. Not only does it have a large 150-sheet input tray, it can also feed envelopes, labels, and transparencies automatically.

Installation and setup are ultrasimple, and inserting the printer cartridges is, literally, a snap. The user doesn't select the actual resolution, but rather the mode (High, Normal, or Fast) and the preset output type (Automatic, Vivid Color, Natural Color for photos, or Black Only). The 7000 is also the only Lexmark ink jet with color RGB, brightness, contrast, and saturation sliders.

We experienced more difficulty with the 7000's paper feed than with any other printer we tested. Virtually every time we

scale picture, draft text printing, and custom settings. Unlike the 2030, it comes with drivers for Windows 95, Windows 3.x, Windows NT, and OS/2, as well as a PCL3 data stream for DOS applications. While touted as a versatile office device,

The 3000 is a solid though somewhat stodgy printer that gets the job done.

#### JETPRINTER 7000: A FEW GLITCHES

The Color Jetprinter 7000 is supposedly the company's best offering, with faster

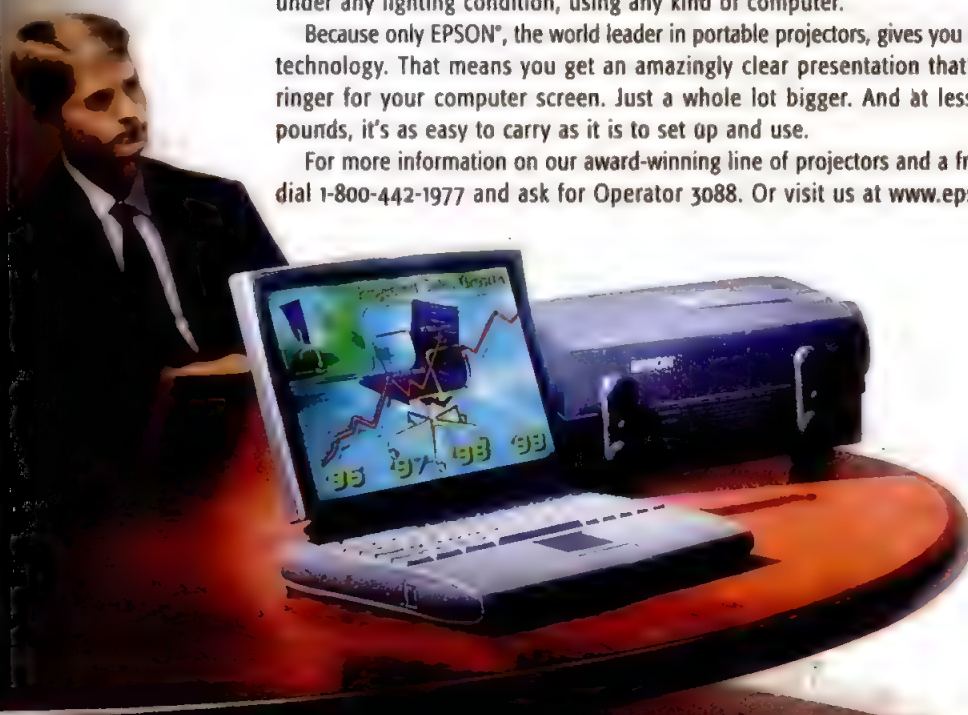
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**COVER STORY**  
*Personal Printers*

gave the print command, the printer reported Paper Out or fed in two or three sheets at a time. Fanning the paper and changing from plain to coated to glossy didn't help. Thinking we might have received a defective printer, we asked Lexmark to send another; the same misfeeds occurred with the second machine. In the end, we were reduced to feeding in one sheet at a time manually.

With its high resolution, we had expected the 7000's output to shine. And indeed, text was very sharp, crisp, and black—better than 600 dpi laser output. Gray gradients were slightly mauve rather than monochromatically black, but banding was insignificant. Photos were slightly washed, with skin tones natural and correctly illuminated, and details were well reproduced in the highlights. But unfortunately, the 7000 occasionally places dots randomly where they don't belong, impacting in a negative way on otherwise excellent output.

Although reasonably priced and quick on its feet, the Color Jetprinter 7000 isn't ready for prime time. Lexmark

needs to fix the serious paper feed problem and eliminate random dot placement before this unit can take its place as the company's flagship color ink jet.—*DG and SWG*

**Lexmark International Inc.**, Lexington, KY; 800-539-6275, 606-232-2000; [www.lexmark.com](http://www.lexmark.com). Circle 476 on reader service card.

### **Olivetti JP 90**

*Letter-size 3-color portable ink jet. Monochrome: 3 ppm, 600 by 300 dpi. Color: 0.3 ppm, 300 dpi. Windows only. \$250 street.*

The Olivetti JP 90 is a portable printer designed for the on-the-go business user who wants to switch between monochrome and color output. But given its high frustration level and poor print quality, we can't recommend it, especially given the virtues of the Canon BJC-80 portable printer also reviewed in this roundup.

The JP 90 is small and light (weighing in at just under 2.5 pounds), and its ink cartridge (black or tricolor) snaps in easily. But almost every new cartridge we installed gave us a "no ink" warning and initially refused to work. The print head

needs cleaning to avoid smearing, and removing cartridges usually means ink-stained fingers. The unit also is prone to periodic jams and frequent paper misfeeds.

The Olichrome color driver has numerous color match and output options, as well as presets for business, photos, and other uses. But regardless of the media and how the parameters were set, our test prints were uniformly awful. Type was light and dirty, and there were dropouts that lost entire lines. Colors were generally washed, and images looked dingy. The ink oversaturated plain paper and laid down what actually looked like plaid lines on glossy paper.

Even on our speed tests, the JP 90 performed poorly, posting the lowest scores of the roundup on many of our application tests. Given the great output and comparable prices of some of its competitors, the Olivetti JP 90 is worth avoiding.—*DG and SWG*

**Olivetti Office USA**, Bridgewater, NJ; 800-253-9869, 800-582-3799, 908-526-8200. Circle 477 on reader service card.

**Projected Sales Growth**

| Year | Units  |
|------|--------|
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| '97  | 27,000 |
| '98  | 35,000 |
| '99  | 46,000 |

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# Ink Jet Output: Better than Ever

*It's nothing short of incredible how far ink jet printers have come in terms of output quality. Mediocre output this year is still better than the best output of two years ago.*

The quality of ink jet printer output on the whole has improved vastly over the past two years. The best printers can produce text that is nearly identical to laser output, and color images can pass for true photographs.

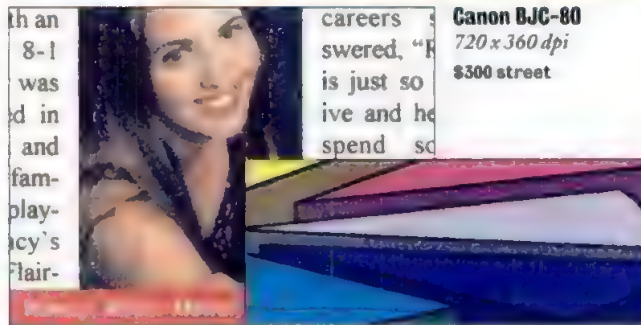
Our two test files have a combination of elements that the typical business and home ink jet user will produce in day-to-day use. The newsletter sample (printed from Microsoft Publisher) shows how well a printer can produce both text and photos in a mixed monochrome/color document. Better printers will show near laser-quality output, with very little bleeding, ink spray, or stray "satellite" dots. The photograph should show smooth gradations in the flesh tones, with no visible dottness. The printer output should also retain good detail in the shadow areas, with no blocky posterization in the highlights.

The pie chart (printed from Microsoft Excel) should contain rich, saturated, vibrant colors, not washed-out or drab tones. Look for clean registration (no white gaps) between adjoining areas of color. Also, better printers should not produce visible banding patterns from successive passes of the print head.

The vast majority of the printers we tested fared well with our output samples. Predictably, the higher-cost printers delivered better output on the average compared with the budget-priced models. The "best in show" awards go to

the samples from our two Editors' Choice ink jets: the Epson Stylus Color 800 and the HP DeskJet 722C. The Epson unit boasts a top resolution of 1,440 by 720 dpi plus what Epson calls Micro Piezo technology, which produces smaller ink drops. The DeskJet 722C also trots out some gee-whiz technology: PhotoREt II, which helps produce more ink drops per pixel in a single pass; new color-matching optimization; and Kodak Image Enhancement (KIE), which creates breathtakingly clear photo images on deluxe photo paper.

Other output worthy of note was produced by the Canon BJC-620, the BJC 4304 Photo, and the BJC-80, the latter a portable printer that weighs about 4 pounds. And all of the Epson Stylus Color printers also were standouts in their respective classes.





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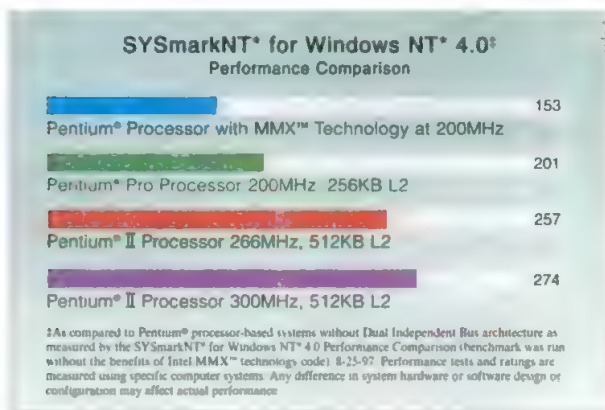
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**COVER STORY**  
*Personal Printers*

Canon BJC-620  
720 dpi  
\$300 street

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Canon BJC-7000  
1,200 x 600 dpi  
\$450 street

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Epson Stylus Color 400  
720 dpi  
\$200 street

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Epson Stylus Color 600  
1,440 x 720 dpi  
\$300 street

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Epson Stylus Color 800  
1,440 x 720 dpi  
\$400 street

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Epson Stylus Photo  
720 dpi  
\$500 street

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Epson Stylus Color 1520  
1,440 x 720 dpi  
\$800 street

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HP DeskJet 400L  
600 x 300 dpi  
\$150 street

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HP DeskJet 672C  
600 dpi  
\$200 street

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HP DeskJet 694C  
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\$300 street

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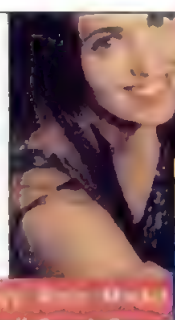
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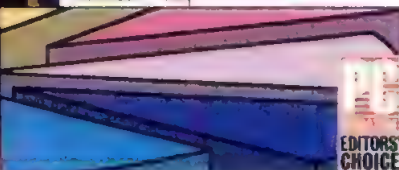
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*Personal Printers*

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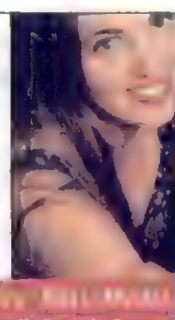
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**HP DeskJet 722C**  
600 dpi (estimated)  
\$350 street



**EDITORS' CHOICE**

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**HP DeskJet 890Cse**  
600 dpi (estimated)  
\$450 street



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**HP DeskJet 1000Cse**  
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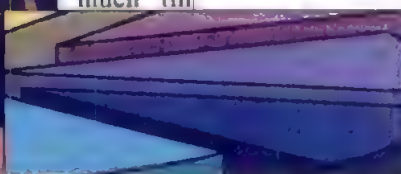


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**HP PhotoSmart Photo Printer**  
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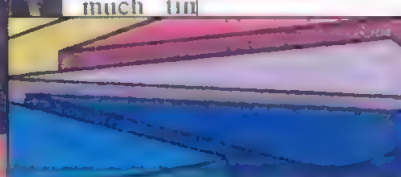


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**Lexmark Color Jetprinter 1000**  
600 dpi  
\$140 street



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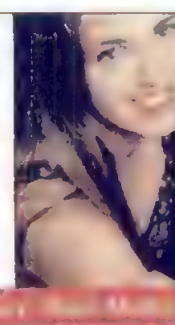


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**Lexmark Color Jetprinter 2030**  
600 x 300 dpi  
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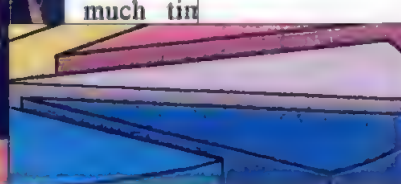


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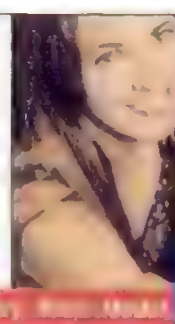


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**Lexmark Color Jetprinter 3000**  
600 x 300 dpi  
\$250 street



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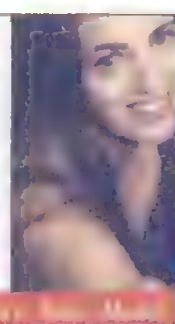


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**Lexmark Color Jetprinter 7000**  
1,200 dpi  
\$400 street



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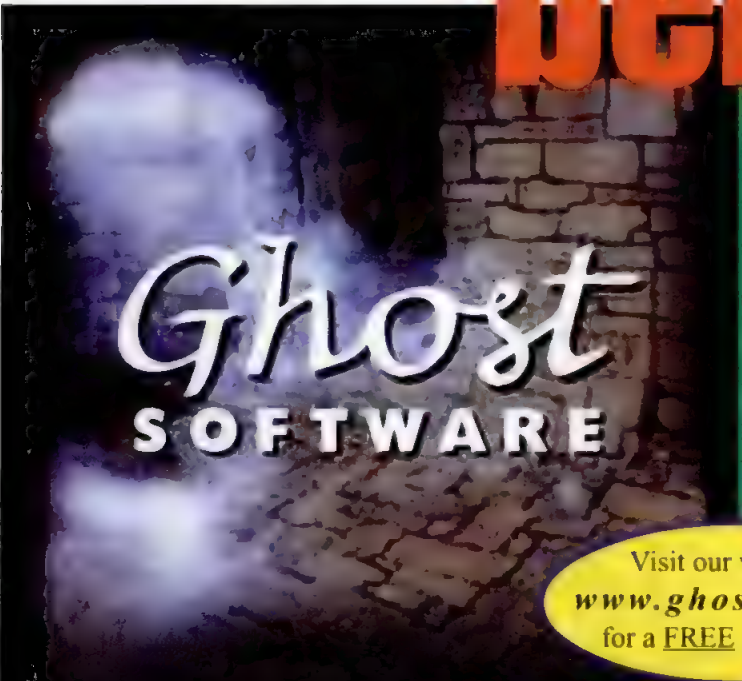
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**Olivetti JP 90**  
600 x 300 dpi  
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# personal laser printers

## Brother HL-730 Plus, HL-760 Plus, HL-1060

HL-730 PLUS: Legal-size monochrome laser. 6 ppm, 600 dpi. Windows only. \$350 street.

HL-760 PLUS: Legal-size monochrome laser. 6 ppm, 600 dpi. Windows only. \$400 street.

HL-1060: Legal-size monochrome laser. 10 ppm, 600 dpi. Windows only. \$700 street.

These three new laser printers from Brother International are good values. While machines from other vendors may be snazzier or speedier, none are simpler to use or better suited for small-office and home users.

Each printer is built around a sensible paper-feed design in which a top-loading input tray feeds into a straight paper path. More money buys you higher interpolated resolution, more capacity, and faster output, but this helpful feature is identical in each of the models. During testing, the printers all handled paper jams well, consistently reprinting fouled pages. They don't jam often; we had to create many of the stoppages artificially. Also, we found that envelopes printed with almost no crinkling.

Brother bundles the Brother Internet Software Suite CD-ROM with each unit, which includes e-mail and Web site printer utilities, a font manager, a duplex printing tool, and copies of popular Internet browsers. Setting up the printers was a simple task, and Windows 95 recognized the machines without a hitch. Unfortunately, installing the toner cartridge is more problematic. The software icons that direct toner installation are confusing, and it's easy to configure them to spill toner inside the unit.

The entry-level HL-730 produced clear dark type with solid blacks on our output samples. Graphics and fills proved more challenging, with noticeable banding in gradients and filled areas. The 730 also lacked skill at handling bitmaps and fine detail in gray-scale photo images. The unit was speedy for its class on our Microsoft Word test and average on the more graphics-intensive application tests.

The HL-760 Plus adds an interpolated 1,200-by-600-dpi mode for better graphics printing. Indeed, our samples showed the same fine text output, and the banding we noticed in graphics all but disappeared with this model. Photo images were good, if a bit too dark in the shadow areas. Speed was generally better than average among the 6-ppm lasers.

The 10-ppm HL-1060 is billed as a workgroup printer: It adds a second 200-sheet paper tray (for a total input capacity of 400 sheets), PostScript Level 2, and network interface options. Output quality was nearly identical to that of the HL-760 Plus. Though the HL-1060 was the fastest-rated printer in this roundup, it did not stand out on our performance tests. Its throughput speed, however, was perfectly adequate.

These Brother printers are simple-to-manage printers with good if not stellar features at a modest price. While not well suited for complex graphics requiring lots of coverage, they are fine choices for typical text needs.—James Karney

**Brother International Corp.**, Somerset, NJ; 800-827-6843, 908-356-8880; [www.brother.com](http://www.brother.com). Circle 478 on reader service card.

## HP LaserJet 6Lse, 6Pse

LASERJET 6LSE: Legal-size monochrome laser. 6 ppm, 600 dpi. Windows only. \$400 street.

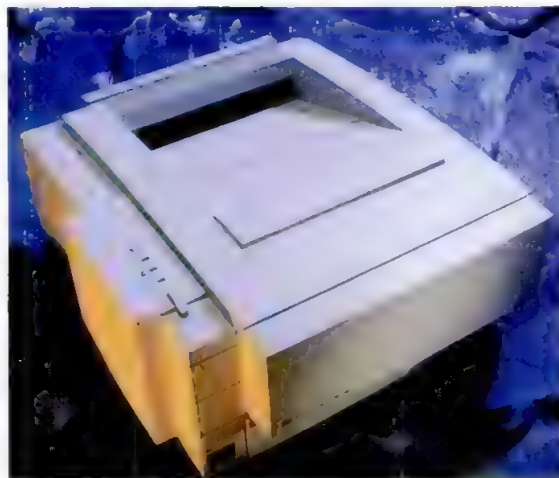
LASERJET 6PSE: Legal-size monochrome laser. 8 ppm, 600 dpi. \$800 street.

Hewlett-Packard's LaserJet 6Lse and LaserJet 6Pse pack a lot of value into a small package, delivering print quality and performance along with solid creature comforts.

The 6Lse is clearly the more personal of the two, with a smallish (100-sheet) paper bin and a tiny footprint designed for cramped desktops and home offices. The "se" in both product names refers to the Internet Publishing Kit software pack-

age bundled with the printers. This CD includes Microsoft Internet Explorer and the Internet Assistant add-ins for Word and Excel, plus a starter Web subscription for the Microsoft Network and a trial version of Microsoft Publisher 97.

The 6Pse is built for heavier loads. Larger paper capacity (250 sheets), flexible paper paths, and multiple ports (including a wireless IrDA port) make it ready to share without a network, and its 12,000-page-per-month duty cycle (twice that of the 6Lse) means that it can really pump out the paper.



HP's LaserJet 6Pse is a robust, full-featured personal laser that could also grow into a workgroup printer.

In terms of performance, the two printers scored about as expected. On the timed tests, the 6Lse was in the middle of the field among 6-ppm units, while the 8-ppm 6Pse scored near the top (second only to the NEC SuperScript 860 overall). Both did a good job on the gray-scale images (though the results were slightly improved by turning off the enhanced resolution feature), text was crisp, and black areas were smooth and solid.

The only noticeable image-quality flaw was that both printers showed some slight horizontal banding on large areas of gray tones. Also, on the paper jam test, the 6Lse started the print job over from the beginning, but the 6Pse lost the jammed page.

Both printers make an excellent choice as personal lasers. If you don't expect to put much of a load on your printer, the 6Lse is the better choice. But if you think that you might want to share the printer in the future, the 6Pse delivers the additional speed, capacity, and features that you'll





### Lexmark Optra E+

*Legal-size monochrome laser. 6 ppm, 600 dpi. \$400 street.*

Lexmark's Optra E+ is a fine low-cost personal laser for SOHO and corporate users. It offers good output quality and a nice feature set. No standout, it's still a safe bet all around.

The Optra E+ comes with a 150-sheet input tray, POET image-enhancement technology, and 2MB of RAM. For testing purposes, we loaded our unit with the maximum option of

6MB (included in our quoted price). Other options include PostScript Level 2 support and a second paper tray that holds 250 sheets. Should you ever want

to share the printer over a network, Lexmark includes its excellent MarkVision network management utility found with its high-end network printers. It's rated duty cycle of 15,000 pages per month is also higher than that of other printers in its class.

Output from the Optra E+ was very good. Text was crisp and gradient fills were outstanding, with a very smooth transition and no banding. Our gray-scale photo image retained detail in the shadow areas. While the output is good, note that the Optra E+ is not a speed demon: It trailed most other 6-ppm printers on our tests. Still, it gets the job done, and it comes with some good features not found on most low-end lasers.—James Karney

**Lexmark International Inc.**, Lexington, KY; 800-539-6275, 606-232-2000; [www.lexmark.com](http://www.lexmark.com). Circle 476 on reader service card.

The Lexmark Optra E+ delivers fine print quality in an affordable package.

..... need.—Alfred Poor

**Hewlett-Packard Co.**, Palo Alto, CA; 800-752-0900, 415-857-1501; [www.hp.com](http://www.hp.com). Circle 475 on reader service card.

## Graphics Lasers: High-Res Output for Prepress Pros

A \$300 laser printer is fine for typical office applications. But if you are a graphics or prepress professional looking for unsurpassed monochrome output, there's a whole niche of lasers designed just for you. At upwards of \$5,000 they aren't cheap, but the ability to produce camera-ready output makes them worth the cost for their intended market.

Notable vendors in this arena include Dataproducts, whose 8-ppm **Typhoon 8** (\$4,499 list) can deliver 1,200-by-1,200-dpi resolution on 11- by 17-inch (tabloid-size) paper. Or consider the **Elite XL 1208** (\$4,999 list) from GCC Technologies. It is also a 1,200-by-1,200-dpi printer, and has an 11.7-by-20-inch print area. There is also a model that can print on polyester printing plates, which can go directly on a printing press for runs as large as 10,000 pages.

To see just what this class of printer has to offer, we took a look at the **Accel-a-Writer 8300** from Xanté. The printer is based on a Canon JX print engine with a 33-MHz RISC processor and is rated at 8 ppm for letter-size sheets. It comes with support for Post-

Script and PCL, with automatic emulation and port switching as standard features. The base model is rated at 600 by 600 dpi, but if you upgrade the printer memory from 8MB to 20MB, it is capable of 1,200- by 1,200-dpi output. We tested a 1,200-dpi model that had a list price of \$4,995.

The printer can handle full-bleed ledger-size output. It comes with a Windows print driver from Adobe that has a wide range of features. Where



The Xanté Accel-a-Writer 8300 can deliver camera-ready laser output.

most inexpensive printers choose settings for the user, the Accel-a-Writer 8300's driver gives the user the ability of specifying the line frequency

and angle for halftone outputs as well as negative or mirror output (which can be useful in converting the output to printing plates). There are also watermark and thumbnail options.

While you may not notice the difference in output quality on a page of text without using a magnifying glass, the quality of continuous-tone images—such as photographs—is stunning when compared with that from an inexpensive printer. The extra resolution creates a finer image, and smaller dots of toner translate into the ability to create more shades of gray in a smaller area. As a result, graphics look far better on pages from this printer.

Not everyone needs the higher resolution of this class of printer, but if your application requires special features for its printed output, check to see if there are laser printers made especially for your needs. The results can be worth the extra cost.—AP  
**Dataproducts Inc.**, Simi Valley, CA; 888-372-6659; [www.dataproducts.com](http://www.dataproducts.com).  
**GCC Technologies**, Bedford MA; 800-422-7777; [www.gcctech.com](http://www.gcctech.com).  
**Xanté Corp.**, Mobile AL; 800-926-8839; [www.xantecorp.com](http://www.xantecorp.com).

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| PC VENDOR       | GRADE     |
|-----------------|-----------|
| Quantex         | Excellent |
| Dell            |           |
| Hewlett-Packard |           |
| IBM             |           |
| Compaq          | Good      |
| Gateway 2000    |           |
| Micron          |           |
| NEC             |           |
| Acer            | Fair      |
| AST             |           |
| Toshiba         |           |
| AT&T            |           |
| Digital         | Poor      |
| Packard Bell    |           |

Windows Magazine, 5/97

## WOULD YOU BUY AGAIN?

| VENDOR          | % WHO WOULD BUY THE SAME BRAND |
|-----------------|--------------------------------|
| Dell            | 92%                            |
| Quantex         | 91%                            |
| Hewlett-Packard | 89%                            |
| IBM             | 89%                            |
| Micron          | 81%                            |
| Gateway         | 80%                            |
| Acer            | 74%                            |
| AST             | 74%                            |
| NEC             | 71%                            |
| AT&T            | 69%                            |
| Digital         | 69%                            |
| Toshiba         | 61%                            |
| Compaq          | 58%                            |
| Packard Bell    | 51%                            |

Windows Magazine, 5/97

"Quantex, making its debut in the desktop category, quickly resolves its callers' problems an impressive 47 percent of the time, compared with the survey average of 31 percent."

PC Magazine 7/97

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- Upgrade to AGP Matrox Millennium II 3D w/4MB WRAM for only \$49
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PERFORMANCE TESTS

# Personal Laser Printers



Among the 12 laser printers we tested, the print times fell in a fairly narrow range for text output. Graphics-intensive files caused more conspicuous differences in throughput rate: Printers with faster engines weren't always the fastest.

## What the Numbers Mean

In general, the rated engine speed was a good indicator of how well a printer would fare against others on the Microsoft Word test and the Microsoft Excel test. The one exception was the Brother HL-1060: Rated at 10 ppm, it performed more like a 6-ppm unit. For example, its time of 00:39 on the Microsoft Excel test was topped by three of the 6-ppm printers.

Overall, the NEC SuperScript 860 (our Editors' Choice) was the best performer, thanks to the speed of its print engine (8 ppm) and the fast processing of its Adobe PrintGear printer imaging architecture. The SuperScript 860's stablemate, the SuperScript 660 plus, also excelled on our throughput tests. It was the fastest

6-ppm printer on three of our four tests.

Our Freelance Graphics test proved most troublesome to the printers. This 4MB file contained a photo and many graphical elements in addition to text. We reset the sleep-mode time-out on the Mita DP-560 to 15 minutes so that it could complete the test. Both the Mita and the Lexmark Optra E+ might have fared better with driver optimization specifically designed for presentation graphics.

Other printer drivers had problems too. The Minolta PageWorks 6e and the NEC SuperScript 660 plus both failed to print the image correctly in their PCL emulation mode, and we had to report their scores as "N/A" on this test.—*Analysis written by Jeff Mace*

## How We Tested

The **Microsoft Word for Windows** test prints a five-page black-and-white text document that uses different fonts and type sizes.

The **Microsoft Excel for Windows** test prints a two-page spreadsheet with line graphs, bar graphs, and pie charts.

The **Microsoft Publisher** test prints a one-page newsletter containing text, graphics, and a gray-scale photo image.

The **Freelance Graphics** test prints a three-page slide presentation containing pie charts, bar graphs, and a gray-scale photo image on a gradient-filled background.

We tested on a Micron Millennia P200 with 32MB of RAM, a

### Minolta PageWorks 6L, 6e

PAGEWORKS 6L: Legal-size monochrome laser. 6 ppm, 600 dpi. Windows only. \$300 street.

PAGEWORKS 6E: Legal-size monochrome laser. 6 ppm, 600 dpi. Windows only. \$380 street.

These two offerings from Minolta's PageWorks line are more alike than different. Both are good choices for budget-sensitive home and SOHO buyers who need a Windows printer primarily for text output.

The differences between the 6L and the 6e lie in their ports and emulation options. The 6L has a single low-density Centronics connector, while the 6e adds a second Centronics port, an IrDA wireless port, PCL 5e emulation, and an interpolated resolution of 1,200 dpi. Each unit has a small footprint and is about the size of a toaster.

Minolta's print driver has a number of handy features. For example, you can custom-format your output for manual duplexing printing or for creating booklets. A special utility provides an on-screen status display of the printer. While the driver gives less control over advanced settings

than some others, it has adequate features and was able to handle our paper jam test without losing or repeating any pages.

These printers also come with a range of other files: 96 fonts and an underpowered font manager; a CD-ROM with templates for Microsoft Word for Windows and Microsoft Excel; and a collection of

*Priced at just \$200  
on the street, Mita's  
legal-size monochrome  
DP-560 is the least  
expensive laser printer  
we've seen.*

clip art and photographs. There also is a set of utilities to facilitate sharing the printer on a network, though you'll want to add the optional 250-sheet bin (\$199) if you plan to network the units.

In our output samples, text from both

units was clear, and large areas of black were uniform. Gray-scale images came out noticeably darker than they should have, however, and there was some horizontal banding on large gray areas. On the timed tests, both printers turned in somewhat sluggish scores, though the 6L tended to be a bit faster than the 6e.

The PageWorks siblings are good choices for users for whom speed and graphics output are less important than a low price.—*AP*

**Minolta Corp.**, Mahwah, NJ; 888-264-6658, 201-512-5800; [www.minoltaprinters.com](http://www.minoltaprinters.com). Circle 481 on reader service card.

### Mita DP-580

Legal-size monochrome laser. 6 ppm, 600 dpi. Windows only. \$200 street.

Mita's easy-to-use DP-560 is a true bargain for home users and students who need an affordable Windows text printer without the frills.

The little Mita contains 1MB of non-expandable memory and a single, top-mounted, 100-sheet paper-feed tray. The output tray is just a wire stop set underneath the unit.



Bold type denotes first place.  
Minutes:seconds

|                                  | Microsoft Word | Microsoft Excel | Microsoft Publisher | Freelance Graphics |
|----------------------------------|----------------|-----------------|---------------------|--------------------|
| <b>6-PPM RATED ENGINE SPEED</b>  |                |                 |                     |                    |
| Brother HL-730 Plus              | 1:06           | 0:37            | 0:34                | 0:54               |
| Brother HL-760 Plus              | 1:06           | 0:35            | 0:32                | 1:01               |
| HP LaserJet 6Lao                 | 1:13           | 0:41            | 1:08                | 1:37               |
| Lexmark Optra E+                 | 1:14           | 0:50            | 1:13                | 1:55               |
| Minolta PageWorks 6L             | 1:09           | 0:37            | 0:32                | 0:58               |
| Minolta PageWorks 6e             | 1:19           | 0:43            | 0:40                | N/A                |
| Mita DP-560                      | 1:15           | 0:45            | 0:30                | 1:43               |
| NEC SuperScript 660plus          | 1:06           | 0:35            | 0:28                | N/A                |
| Okidata OkiPage 6e               | 1:10           | 0:43            | 0:38                | 1:19               |
| <b>8-PPM RATED ENGINE SPEED</b>  |                |                 |                     |                    |
| HP LaserJet 6Pso                 | 0:58           | 0:32            | 0:49                | 0:56               |
| NEC SuperScript 860              | 0:50           | 0:29            | 0:31                | 0:50               |
| <b>10-PPM RATED ENGINE SPEED</b> |                |                 |                     |                    |
| Brother HL-1060                  | 1:04           | 0:39            | 0:37                | 0:56               |
|                                  | ◀ BETTER       | ◀ BETTER        | ◀ BETTER            | ◀ BETTER           |

N/A—Not applicable: The printer could not print this file in GDI mode.

2.1GB Western Digital Caviar hard disk, and an 8X Hitachi CD-ROM drive. We ran each of the speed tests twice, and we present the average scores in the charts.

These application tests used files that PC Labs designed to sub-

ject each printer to print jobs typical of most users. We used the default print setting within each application, and we chose the most appropriate mode available within each printer's driver interface for printing that type of job.

Setting up the printer under Windows 95 is simple. You first insert the combination cartridge that houses the toner, developer, and imaging drum. Then you slide the vertical paper tray into the hole on top of the printer, and the output catch snaps on the front of its base. When the unit is attached to the PC and powered on, you simply load the drivers when prompted.

Text output on our tests was clean, with matte blacks. Graphics, however, produced mixed results. The photos looked sharp, with good tone overall, but they lacked detail in the highlights. Our gradient fills showed banding in the lighter areas, and our full-page image had some horizontal banding as well. Envelopes printed with excessive curling or crinkles; they are loaded into the same universal hopper, since there is no separate manual tray. Speed was average among the 6-ppm lasers.

The Mita DP-560 is fine for users who want crisp text and easy operation without spending any more than necessary.—JK  
Mita, Fairfield, NJ; 800-222-6482, 201-808-8444; www.mita.com. Circle 482 on reader service card.

## NEC SuperScript 660plus, 860



SUPERSCRIPT 660PLUS: Legal-size monochrome laser. 6 ppm, 600 dpi. Windows only. \$300 street.

SUPERSCRIPT 860: Legal-size monochrome laser. 8 ppm, 600 dpi. \$400 street.

If you're looking for speed

and you print mostly text, NEC has the laser printer for you. These two value-laden entries from the SuperScript line deliver quick output, decent image quality, and acceptable software support with very few hassles. Both are ideal for SOHO and corporate users alike; the SuperScript 860 is our Editors' Choice among laser printers.

The SuperScript 660plus is a Windows-only printer based on the same Minolta engine that runs the Minolta PageWorks 6L and 6e (reviewed in this roundup). It relies on your computer's processor to do the heavy lifting in page formatting.

The 660plus comes with a driver that provides PCL 5 support for DOS applications running in a window; you'll need to install this from the bundled CD. The main driver defaults to PCL 4 support, however, and you'll have to change the emulation mode manually to use PCL 5. The CD-ROM also includes fonts, a business-forms program with clip art,



The NEC SuperScript 860, our Editors' Choice, was the fastest laser we tested.



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*The BJC-7000's unique dual printhead design has more than 1,000 nozzles for enhanced detail, smoother color gradation and crisp, sharp text.*



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# So real you have to see it to believe it.

## So real you have to see it to believe it.

### So real you have to see it to believe it.

(Hey, is there an echo in here?)

If the Canon BJC-4300 Color Bubble Jet™ printer can generate photo-realistic images this monumentally gorgeous, imagine how grand everything you print will be. Whether you need a brilliant color presentation or a razor-sharp business document, the \$199\* BJC-4300 delivers. Our exclusive Drop Modulation Technology™ puts more detail in the detail and reduces graininess.



*\$99\* turns the BJC-4300 into a 360 dpi color sheetfed scanner. Instantly.*

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# Canon

\*Manufacturer's suggested retail price. Dealer prices may vary. Output shown printed using Photo Ink, sold separately. \*\*Software designed for use with Windows® 95, and available on CD-ROM only. ©1997 Canon Computer Systems, Inc. Canon and BJC are registered trademarks and Bubble Jet, Drop Modulation Technology, PhotoRealism and "See what we mean" are trademarks of Canon Inc. In Canada call 1-800-263-1121.



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extra watermark graphics, and Adobe Acrobat Reader. Both of these printers have clever driver features, such as thumbnail, booklet, and manual-duplex printing.

Text print quality was generally excellent on our tests. Gray-scale images came out too dark under PCL emulation, however, and we saw some horizontal banding on larger areas of gray tones. The 660plus is speedy, posting some of the best times among the 6-ppm units in this roundup.

The 8-ppm SuperScript 860 comes with a richer feature set and more extensive paper-handling capabilities than its companion, making it better suited to a corporate environment. A number of adjustable features, such as jam recovery and offset settings, can be changed only by using a separate DOS utility. Surprisingly, the printer has only PCL 4 emulation, which does not include the advanced font effects and graphics compression modes found in PCL 5 and PCL 6.

The 860 employs Adobe's PrintGear as its printer description language. The software package includes Adobe Type Manager with 78 Type-1 fonts, Internet-in-a-Box, a collection of clip art, a document design guide, and Adobe Acrobat Reader.

As with the 660plus, text output was excellent. Gray-scale graphics quality was better, as samples were not overly dark. On our timed tests, the 860 was the fastest printer in this roundup, beating even the 10-ppm Brother HL-1060 on most tests.

If you're just printing text and you need something fast and cheap, the SuperScript 660plus is a good bet. But the improved performance and graphics output of the 860 is well worth the extra money you'd spend on the upgrade. —AP

**NEC Technologies Inc.**, San Jose, CA; 800-632-4636; [www.nec.com](http://www.nec.com). Circle 483 on reader service card.

## Okidata OkiPage 6e

Legal-size monochrome LED. 6 ppm, 600 dpi. Windows only. \$300 street.

Designed for SOHO users who need an entry-level printer for mostly text applications, the OkiPage 6e is a trim, no-

## SUMMARY OF FEATURES

# Personal Laser Printers

| ■ YES ■ NO □ OPTIONAL<br>Products listed in review order | Brother HL-730 Plus                                  | Brother HL-760 Plus                                  | Brother HL-1060                                      | HP LaserJet 6Lse                           |
|----------------------------------------------------------|------------------------------------------------------|------------------------------------------------------|------------------------------------------------------|--------------------------------------------|
| Street price                                             | \$350                                                | \$400                                                | \$700                                                | \$400                                      |
| Rated engine speed (ppm)                                 | 6                                                    | 6                                                    | 10                                                   | 6                                          |
| Maximum printer engine resolution (dpi)                  | 600                                                  | 600                                                  | 600                                                  | 600                                        |
| Maximum interpolated resolution (dpi)                    | 600                                                  | 1,200 x 800                                          | 1,200 x 800                                          | 600                                        |
| Standard/maximum RAM                                     | 1MB/2MB                                              | 1MB/33MB                                             | 2MB/34MB                                             | 1MB/2MB                                    |
| Memory compression technology                            | EMM                                                  | EMM                                                  | EMM                                                  | HP Met                                     |
| Engine type/manufacturer                                 | Laser/Brother                                        | Laser/Brother                                        | Laser/Brother                                        | Laser/HP                                   |
| Processor speed and type                                 | Info not available                                   | Info not available                                   | Info not available                                   | 24-MHz RISC                                |
| Printer dimensions (HWD, in inches)                      | 9.8 x 14.4 x 13.9                                    | 9.8 x 14.4 x 15.1                                    | 10.8 x 15.8 x 17.3                                   | 8.9 x 13.2 x 12.3                          |
| Printer weight (pounds)                                  | 14.3                                                 | 15.4                                                 | 21.2                                                 | 15.9                                       |
| <b>Paper Handling and Interfaces</b>                     |                                                      |                                                      |                                                      |                                            |
| Input/output tray capacity (sheets)                      | 200 / 100                                            | 200 / 100                                            | 400 / 100                                            | 100 / 100                                  |
| Capacity/price of extra input tray                       | N/A*                                                 | N/A*                                                 | N/A*                                                 | N/A*                                       |
| Can use trays from previous model                        | ■                                                    | ■                                                    | ■                                                    | ■                                          |
| Heaviest paper (pounds)                                  | 42                                                   | 42                                                   | 42                                                   | 43                                         |
| Number of paper paths                                    | 2                                                    | 2                                                    | 3                                                    | 2                                          |
| Prints on legal-size paper/envelope                      | ■ ■                                                  | ■ ■                                                  | ■ ■                                                  | ■ ■                                        |
| Parallel/serial port                                     | ■ □ (\$99.95)                                        | ■ □ (\$99.95)                                        | ■ □ (\$99.95)                                        | ■ ■                                        |
| Bidirectional/ECP parallel port                          | ■ ■                                                  | ■ ■                                                  | ■ ■                                                  | ■ ■                                        |
| C-size parallel/LocalTalk/IrDA port                      | ■ ■ ■                                                | ■ ■ ■                                                | ■ ■ ■                                                | ■ ■ ■                                      |
| Simultaneously active ports                              | ■                                                    | ■                                                    | ■                                                    | ■                                          |
| <b>Drivers and Software</b>                              |                                                      |                                                      |                                                      |                                            |
| Prints from OSs other than Windows                       | ■                                                    | ■                                                    | ■                                                    | ■                                          |
| Prints from a DOS box in Windows                         | ■                                                    | ■                                                    | ■                                                    | ■                                          |
| RAM required on PC for GDI printing                      | 4MB                                                  | 4MB                                                  | 4MB                                                  | 16MB                                       |
| Highest PCL                                              | PCL 5e                                               | PCL 5e                                               | PCL 5e                                               | PCL 5e                                     |
| PostScript Level 2/PrintGear                             | ■ ■                                                  | ■ ■                                                  | □ (\$149) ■                                          | ■ ■                                        |
| Other emulations                                         | Epson FX-850, IBM ProPrinter XL                      | Epson FX-850, IBM ProPrinter XL                      | Epson FX-850, IBM ProPrinter XL                      | None                                       |
| Driver for Windows 3.x/95/NT                             | ■ ■ ■                                                | ■ ■ ■                                                | ■ ■ ■                                                | ■ ■ ■                                      |
| Driver for OS/2 / Mac OS                                 | ■ ■                                                  | ■ ■                                                  | ■ ■                                                  | ■ ■                                        |
| Driver applet features:                                  |                                                      |                                                      |                                                      |                                            |
| Watermarks/Booklets                                      | ■ ■                                                  | ■ ■                                                  | ■ ■                                                  | ■ ■                                        |
| Thumbnail (n-up) printing                                | ■                                                    | ■                                                    | ■                                                    | ■                                          |
| Manual duplexing                                         | ■                                                    | ■                                                    | ■                                                    | ■                                          |
| Toner or cartridge capacity (pages)                      | 2,200                                                | 2,200                                                | 2,200                                                | 2,500                                      |
| Rated duty cycle (pages per month)                       | 3,000                                                | 3,000                                                | 3,000                                                | 6,000                                      |
| Estimated cost per page: 5 percent coverage              | 1.2 cents                                            | 1.2 cents                                            | 1.2 cents                                            | 1.2 cents                                  |
| <b>Support</b>                                           |                                                      |                                                      |                                                      |                                            |
| Toll-free technical support (eastern time)               | 9:00-8:00 M-F                                        | 9:00-8:00 M-F                                        | 9:00-8:00 M-F                                        | 8:00 A.M.-midnight M-F, noon-7:00 Sat.     |
| Warranty                                                 | 1 year                                               | 1 year                                               | 1 year                                               | 1 year                                     |
| Overnight exchange under warranty                        | ■                                                    | ■                                                    | ■                                                    | ■                                          |
| Web address                                              | <a href="http://www.brother.com">www.brother.com</a> | <a href="http://www.brother.com">www.brother.com</a> | <a href="http://www.brother.com">www.brother.com</a> | <a href="http://www.hp.com">www.hp.com</a> |

N/A\*—Not applicable: The printer does not have this feature.

N/A\*\*—Not applicable: This printer can print natively from DOS.

nonsense fit for its target audience.

The OkiPage 6e comes with extras not usually found in its price range, such as a variety of emulations (IBM ProPrinter, Epson FX, USPS bar codes, in addition to its standard PCL 5e), 1MB of RAM upgradable to 17MB, and options to add a second 250-sheet second tray

(\$259) and a 100-sheet/50-envelope power feeder. The unit also ships with a complete driver set covering Microsoft Windows 3.x, Windows 95, Windows NT (3.5 and 4.0) and MS-DOS.

A similar system, the Okidata OkiPage 6ex, is aimed at business and corporate users but a unit was not ready in



PC MAGAZINE  
\*\*\*\*\*  
EDITORS' CHOICE

| HP LaserJet 6Pso  | Lexmark Optra E+         | Minolta PageWorks 6L | Minolta PageWorks 6e | Mita DP-550       | NEC SuperScript 550plus  | NEC SuperScript 850  | Okidata OkiPage 6e |
|-------------------|--------------------------|----------------------|----------------------|-------------------|--------------------------|----------------------|--------------------|
| \$800             | \$400                    | \$300                | \$380                | \$200             | \$300                    | \$400                | \$300              |
| 8                 | 6                        | 6                    | 6                    | 6                 | 6                        | 8                    | 6                  |
| 600               | 600                      | 600                  | 600                  | 600               | 600                      | 600                  | 300 x 1,200        |
| 600               | 600                      | N/A*                 | 1,200                | 600               | N/A*                     | N/A*                 | 600                |
| 2MB/4MB           | 2MB/6MB                  | 256K/4.25MB          | 2MB/34MB             | 1MB/1MB           | 256K/4MB                 | 1MB/5MB              | 1MB/17MB           |
| HP Met            | RAMSmart                 | None                 | None                 | None              | None                     | Adobe Memory Booster | EMM                |
| Laser/HP          | Laser/Info not available | Laser/Minolta        | Laser/Minolta        | Laser/Mita        | Laser/Info not available | Laser/NEC            | LED/Okidata        |
| 24-MHz RISC       | 16-MHz RISC              | 16-MHz RISC          | 16-MHz RISC          | 7-MHz RISC        | N/A*                     | 50-MHz PrintGear     | 25-MHz RISC        |
| 7.9 x 15.7 x 17.5 | 8.6 x 13.7 x 9.7         | 8.3 x 13.3 x 8.5     | 8.3 x 14.5 x 8.5     | 5.4 x 12.2 x 10.0 | 9.9 x 13.8 x 9.5         | 9.1 x 14.6 x 16.9    | 6.9 x 12.6 x 14.2  |
| 24.5              | 13.2                     | 13.2                 | 14.9                 | 13.0              | 16.5                     | 20.3                 | 17.0               |
| 250 / 100         | 150 / 100                | 150 / 100            | 150 / 100            | 100 / 30          | 150 / 100                | 200 / 50             | 100 / 100          |
| N/A*              | 250 sheets/\$199         | 250 sheets/\$199     | 250 sheets/\$199     | N/A*              | 250 sheets/\$169         | N/A*                 | 250 sheets/\$259   |
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| 43                | 24                       | 90                   | 90                   | 24                | 28                       | 28                   | 32                 |
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time for this review.

This printer does an admirable job with text, producing clean black letters with no shiny highlights from the toner. Details on bold type are crisp and easy to read. The OkiPage was less adept with gray-scale graphics, however; on our tests, gradient fills showed noticeable

banding, and photos lacked definition in the shadow areas.

This printer's straight paper path made it difficult for us even to create a paper jam, and the OkiPage properly recovered and printed our test's lost page. Envelopes came through with minimal wrinkles. Performance was average on

our speed tests. All in all, the OkiPage 6c would make an able addition to any small business that doesn't rely heavily on graphics or needs high-volume output.—JK

**Okidata Corp.**, Mount Laurel, NJ; 800-654-3282, 609-778-2600; [www.okidata.com](http://www.okidata.com).  
*Circle 484 on reader service card.*





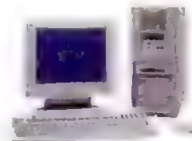
**Introducing HP's new Kayak PC Workstations.  
They have enough processing power to redesign anything.  
Including the workstation industry.**

It isn't merely fast. It has *twice* the graphics performance of Sun's™ Ultra™ 2 UNIX® Workstation. (At nearly half the price.) And twice the graphics performance of any Intel-based machine. In fact, Kayak is a whole family of PC Workstations, starting at under \$3000.\* They have features you



Kayak XU

won't find on much more expensive machines. Like AGP graphics and



Kayak XA

FastRAID SCSI accelerators.† Imagine rendering 3.4 million 25-pixel triangles per second. Imagine getting home on time for a change. But we're not just a leader in speed; we're the leader in Windows® NT PC Workstations. And don't forget our NT/UNIX interoperability backed by our strong UNIX heritage. All told, it's little wonder the workstation industry will never be the same again. For a quick Kayak preview, visit [www.hpresource.com/kayak](http://www.hpresource.com/kayak)



# Laser Output: Great Text, Mixed Graphics

*If you want a printer for quick, cost-effective output of business correspondence, a laser is still the best choice.*

**A**lthough some models handled graphics less adroitly, text output from these 12 laser printers was universally excellent.

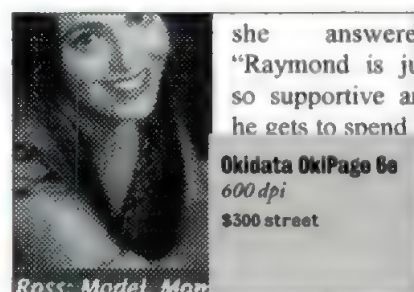
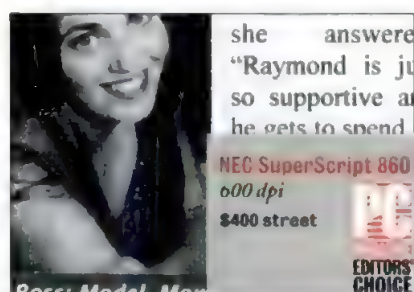
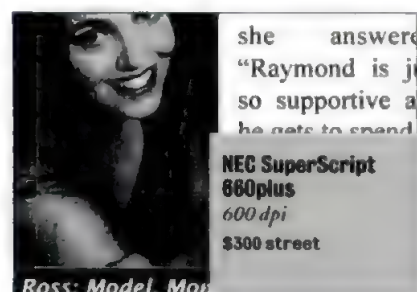
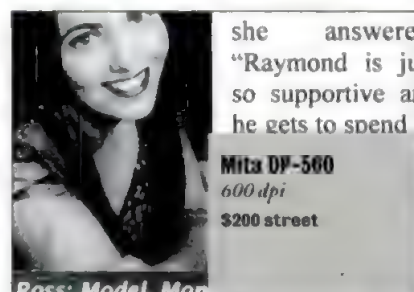
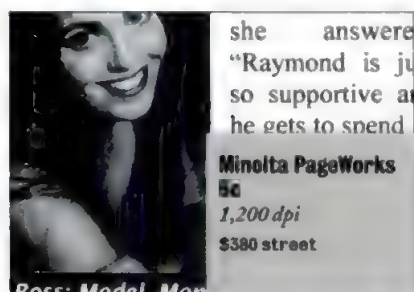
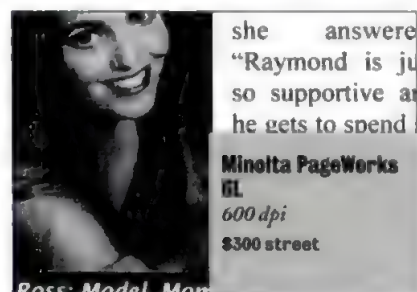
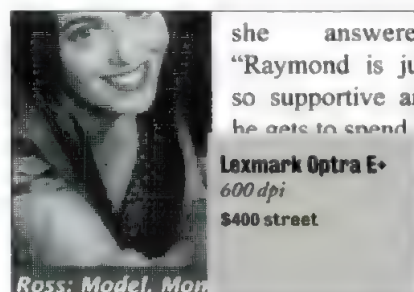
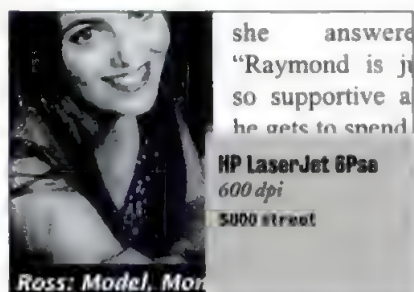
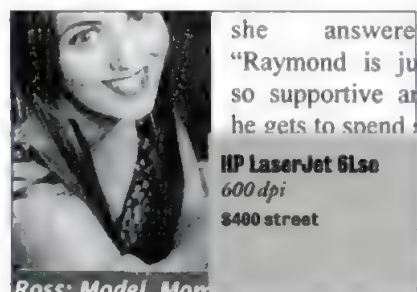
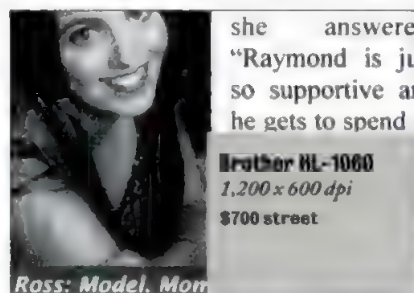
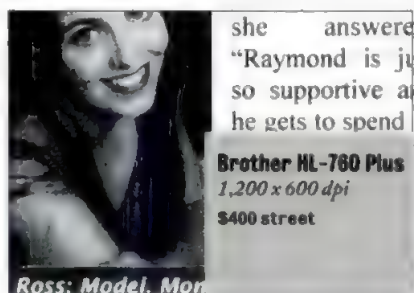
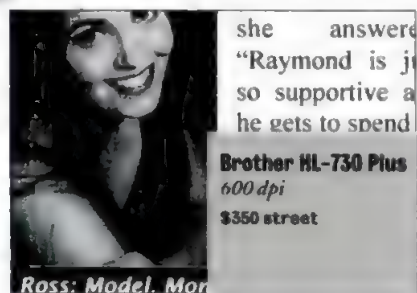
Our newsletter page (printed from Microsoft Publisher) lobbed a softball at these laser printers followed by a split-fingered fastball. All of the models produced sharp, flawless text—the raison d'être of laser printers. The photo image proved more challenging.

Better printers did show a good range of gray shades, and had with no noticeable dots. The HP LaserJet 6Lse

and 6Pse, as well as the Lexmark Optra E+, reproduced such gray-scale graphics well.

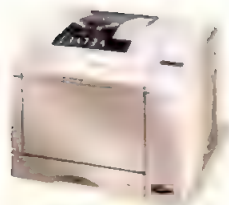
Several printers—including the Brother HL-730 Plus, Mita DP-560, and NEC SuperScript 660 Plus—tended to overdarken the photo.

Most of the lasers also produced noticeable banding on gradient fills or large areas of coverage: The Brother HL-730, both HP LaserJets to some extent, both Minolta PageWorks entries, the Mita DP-560, the NEC SuperScript 660plus, and the Okidata Okipage 6e all were culprits here.





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# multifunction printers

## Brother MFC-4550, MFC-7000FC



**MFC-4550:** Legal-size monochrome laser (also monochrome scanner, fax, and copier). 6 ppm, 600 dpi. \$700 street.

**MFC-7000FC:** Legal-size four-color ink jet (also color scanner, fax, color copier). Monochrome: 5 ppm,

720 dpi. Color: 3 ppm, 720 dpi. \$1,000 street.

In last year's roundup of multifunction printers, we awarded our Editors' Choice to the Brother MFC-4550 for its excellent output quality and lightning speed. Now with the introduction of its companion, the MFC-7000FC, the older unit has been bumped from the top of the line—and its price has fallen accordingly. Both units are excellent candidates for you or your business; for our money, we'd opt for the color capabilities of the MFC-7000FC.

The two machines bear a strong family resemblance. They each have a similar range of controls, including the requisite telephone keypad and 12 programmable speed-dial buttons for 24 phone numbers. Both look like ordinary fax machines, complete with telephone handsets. The control panel on each unit pivots open to allow you to clear jams in the scanner, which lies underneath.

The MFC-4550 has a fast, fax-based monochrome scanner capable of 200- by 400-dpi resolution. Using the laser engine, you can produce monochrome copies in a mere 20 seconds. On our print quality and speed tests, the MFC-4550 still scores at the top of the heap—especially on the Microsoft Word speed test, where the unit posted the best time in the roundup. A handsome device and a better value than ever, this one-year-old veteran still has the right stuff if mono-

chrome output fills your bill.

The MFC-7000FC is loaded with new features. It comes with a color scanner, a color ink jet print engine, a message center with speakerphone, and video capture capability. Each of the four printer inks is stored in a separate cartridge, so you just replace the one that is empty; black has extra capacity.

The MFC-7000FC's scanner/copier runs at an optical resolution of 300 dpi, interpolated to 1,200 dpi. The scanner's document feeder accepts up to 30 pages, and the printer input tray holds up to 120



The Brother MFC-7000FC, our Editors' Choice, delivers color printing, color scanning, and color copying, all at reasonable speeds.

blank sheets (you have to feed legal-size sheets manually). As a copier, it cranks out its first page in about 30 seconds in monochrome and 90 seconds in color, and it allows reduction to 50 percent and enlargement to 200 percent. Text output on plain paper is good (if just a touch light), and color-intensive business graphics show very little banding and good color saturation.

Although the ink jet engine puts it at a speed disadvantage—its throughput is less than half that of the MFC-4550—Brother has eked quite a bit of perfor-

mance out of it. The MFC-7000FC consistently scored in first or second place among ink jet-based devices on our tests. Brother has done it again: This multifunction printer is a worthy successor to its counterpart.—Winn L. Rosch

**Brother International Corp.**, Somerset, NJ; 800-827-6843, 908-356-8880; [www.brother.com](http://www.brother.com). Circle 478 on reader service card.

## Canon MultiPass C3000

**Legal-size four-color ink jet (also monochrome scanner, fax, and copier).** Monochrome: 5 ppm, 720 by 360 dpi. Color: 2 ppm, 720 by 360 dpi. Windows only. \$500 street.

An average performer with a reasonable if unexceptional set of features, the MultiPass C3000 is one of the least expensive multifunction printers in this roundup. Despite some shortcomings, it's

worth a look for SOHO shoppers on a tight budget who want a good ink jet printer first and other functions as a bonus.

The MultiPass has a standard telephone touch pad on the front, along with a 16-digit LCD screen and about a dozen assorted buttons for various functions. The scanner, located on top of the unit, is limited to monochrome capture with 8-bit gray-scale capability.

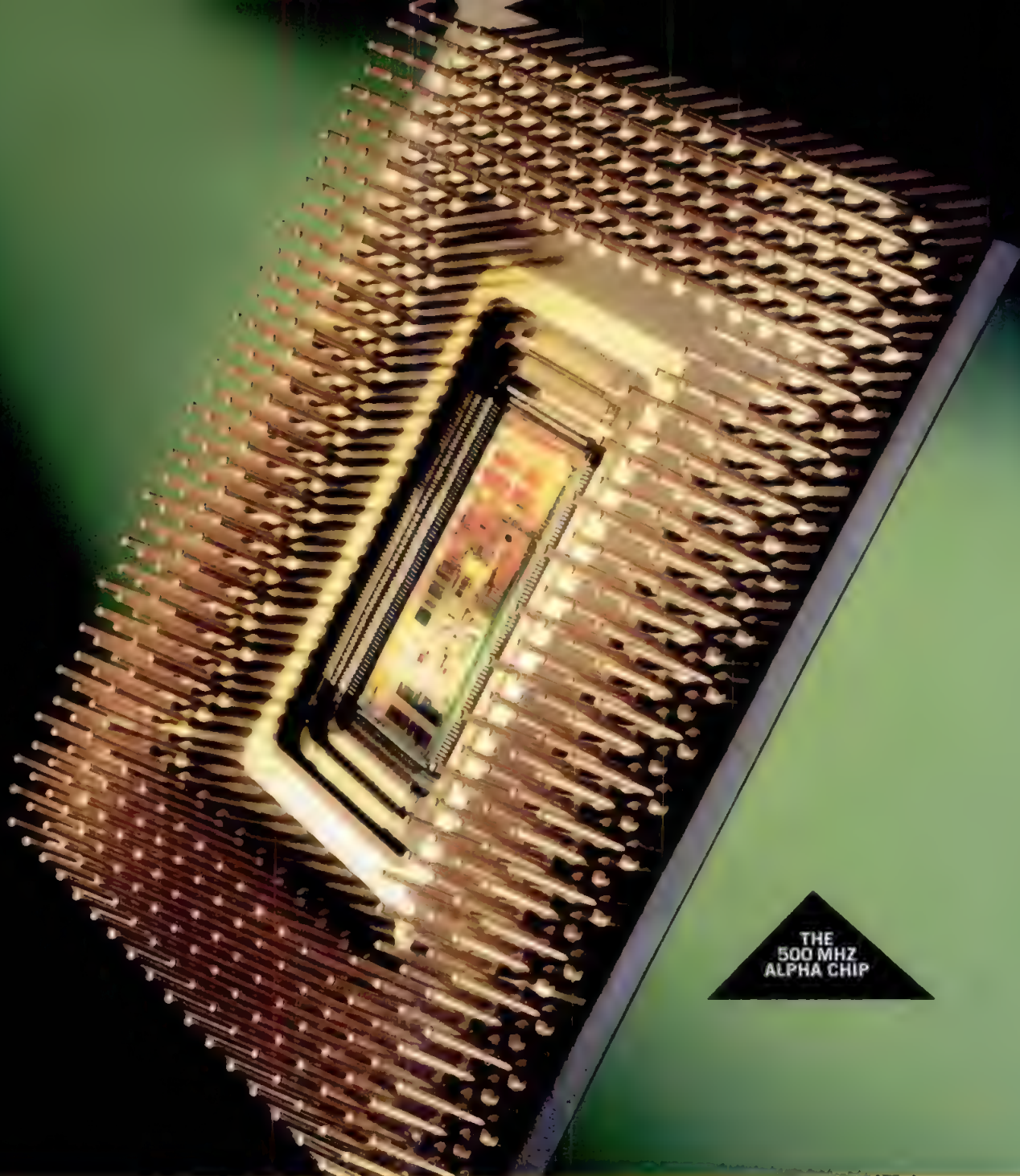
Paper capacity is ample. Up to 100 legal-, letter-, or A4-size sheets can be fed from the rear of the unit; they exit image-up in the front. The input tray also holds 10 envelopes. Built around the same ink jet engine used in Canon's BJC-4200 se-

ries (the highest-resolution ink jet engine among the multifunction printers we tested), the MultiPass produces excellent near-photo-quality images when stocked with special photo paper. Print speeds are average, running straight down the middle of this roundup's scores.

Unfortunately, the inking system for incoming faxes proved problematic on our tests. The machine ran out of ink rather quickly and gave no alert, continuing to crank out blank sheets. Copier speed was slower than average, at over a minute for each page, and copier output



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# Multifunction Printers



■ YES ■ NO

Products listed in alphabetical order

|                                                                                                  | Brother<br>MFC-4550                                  | Brother<br>MFC-7000FC                                | Canon Multi-<br>Pass C3000                                 | HP OfficeJet<br>570                        | HP OfficeJet<br>610                        | HP OfficeJet<br>Pro 1150Cee                                                  | Panasonic<br>KX-PS600                                                | Xerox<br>HomeCentre                              | Xerox Docu-<br>ment Work-<br>Centre 450c         |
|--------------------------------------------------------------------------------------------------|------------------------------------------------------|------------------------------------------------------|------------------------------------------------------------|--------------------------------------------|--------------------------------------------|------------------------------------------------------------------------------|----------------------------------------------------------------------|--------------------------------------------------|--------------------------------------------------|
| List/street price, tested configuration                                                          | \$1,399 / \$700                                      | \$1,649 / \$1,000                                    | N/A* / \$500                                               | N/A* / \$600                               | N/A* / \$600                               | N/A* / \$900                                                                 | N/A* / \$600                                                         | \$899 / \$500                                    | \$999 / \$550                                    |
| Printing technology                                                                              | Monochrome<br>laser                                  | 4-color ink jet                                      | 4-color ink jet                                            | 4-color ink jet                            | 4-color ink jet                            | 4-color ink jet                                                              | Monochrome<br>laser                                                  | 4-color ink jet                                  | 4-color ink jet                                  |
| Cost of black replacement toner or ink                                                           | \$36.95                                              | \$16.99                                              | \$7.44                                                     | \$32.95                                    | \$32.95                                    | \$32.95                                                                      | \$39.95                                                              | \$39.99                                          | \$39.99                                          |
| Cost of color replacement toner or ink                                                           | N/A*                                                 | \$8.99<br>(each color)                               | \$20.84                                                    | \$34.95                                    | \$34.95                                    | \$34.95                                                                      | N/A*                                                                 | \$9.99<br>(each color)                           | \$9.99<br>(each color)                           |
| Cost per page for typical double-spaced mono-<br>chrome print, fax, or copy (5 percent coverage) | 1.6 cents                                            | 2.4 cents                                            | 3.0 cents                                                  | 4.0 cents                                  | 4.0 cents                                  | 2.0 cents                                                                    | 2.7 cents                                                            | 3.6 cents                                        | 3.6 cents                                        |
| Dimensions (HWD, in inches)                                                                      | 9.9 x 15.1 x<br>17.8                                 | 11.8 x 18.3 x<br>20.3                                | 7.8 x 15.8 x<br>14.2                                       | 10.2 x 17.0 x<br>14.2                      | 10.2 x 17.0 x<br>14.2                      | 2.8 x 21.3 x<br>17.7                                                         | 11.5 x 7.5 x<br>15.9                                                 | 17.9 x 17.4 x<br>9.3                             | 12.0 x 16.5 x<br>17.5                            |
| Weight (pounds)                                                                                  | 18.8                                                 | 22.1                                                 | 13.2                                                       | 15.0                                       | 15.0                                       | 32.2                                                                         | 18.7                                                                 | 22.0                                             | 18.5                                             |
| <b>Printing</b>                                                                                  |                                                      |                                                      |                                                            |                                            |                                            |                                                                              |                                                                      |                                                  |                                                  |
| Rated monochrome/color speed                                                                     | 6 ppm / N/A*                                         | 5 ppm / 3 ppm                                        | 5 ppm / 2 ppm                                              | 5 ppm / 2 ppm                              | 5 ppm / 2 ppm                              | 8 ppm / 4 ppm                                                                | 6 ppm / N/A*                                                         | 4 ppm / 1 ppm                                    | 6 ppm / 1 ppm                                    |
| Maximum monochrome resolution (dpi)                                                              | 600 x 600                                            | 720 x 720                                            | 720 x 360                                                  | 600 x 600                                  | 600 x 600                                  | 600 x 600                                                                    | 600 x 600                                                            | 600 x 600                                        | 600 x 600                                        |
| Maximum color resolution (dpi)                                                                   | N/A*                                                 | 720 x 720                                            | 720 x 360                                                  | 600 x 300                                  | 600 x 300                                  | 600 x 300                                                                    | N/A*                                                                 | 300 x 300                                        | 600 x 600                                        |
| Color cartridges are individually replaceable                                                    | N/A*                                                 | ■                                                    | ■                                                          | ■                                          | ■                                          | ■                                                                            | N/A*                                                                 | ■                                                | ■                                                |
| "Low ink or toner" warning                                                                       | ■                                                    | ■                                                    | ■                                                          | ■                                          | ■                                          | ■                                                                            | ■                                                                    | ■                                                | ■                                                |
| Stops printing when one color runs out                                                           | N/A*                                                 | ■                                                    | ■                                                          | ■                                          | ■                                          | ■                                                                            | N/A*                                                                 | ■                                                | ■                                                |
| Rated monthly duty cycle (pages)                                                                 | 2,500                                                | 2,000                                                | Info not<br>available                                      | 830                                        | 830                                        | 1,000                                                                        | 2,000                                                                | 500                                              | 500                                              |
| Can print from OSs other than Windows                                                            | ■                                                    | ■                                                    | ■                                                          | ■                                          | ■                                          | ■                                                                            | ■                                                                    | ■                                                | ■                                                |
| Prints from DOS box in Windows                                                                   | N/A**                                                | N/A**                                                | ■                                                          | ■                                          | ■                                          | N/A**                                                                        | ■                                                                    | ■                                                | N/A**                                            |
| Printer emulations supported                                                                     | Brother, Epson                                       | Brother, Epson                                       | None                                                       | PCL 3                                      | PCL 3                                      | PCL 3                                                                        | GDI, PCL                                                             | PCL 3c                                           | PCL 3c                                           |
| Memory                                                                                           | 512K                                                 | 2MB                                                  | 64K                                                        | None                                       | None                                       | None                                                                         | 512K                                                                 | 512K                                             | 512K                                             |
| Input/output tray capacity (sheets)                                                              | 200 / 100                                            | 200 / 100                                            | 100 / 100                                                  | 150 / 50                                   | 150 / 50                                   | 150 / 50                                                                     | 100 / 50                                                             | 100 / 35                                         | 150 / 20                                         |
| Transparency/envelope capacity                                                                   | 10 / 10                                              | 100 / 25                                             | 50 / 10                                                    | 1 / 15                                     | 1 / 15                                     | 1 / 15                                                                       | 30 / 10                                                              | 20 / 10                                          | 20 / 10                                          |
| <b>Faxing</b>                                                                                    |                                                      |                                                      |                                                            |                                            |                                            |                                                                              |                                                                      |                                                  |                                                  |
| Modem speed                                                                                      | 14.4 Kbps                                            | 14.4 Kbps                                            | 14.4 Kbps                                                  | 14.4 Kbps                                  | 14.4 Kbps                                  | N/A*                                                                         | N/A*                                                                 | N/A*                                             | 14.4 Kbps                                        |
| Paper feed/memory capacity (pages)                                                               | 30 / 40                                              | 30 / 100                                             | 100 / 42                                                   | 20 / 45                                    | 20 / 65                                    | N/A*                                                                         | N/A*                                                                 | N/A*                                             | 150 / 23                                         |
| Telephone handset                                                                                | ■                                                    | ■                                                    | ■                                                          | ■                                          | ■                                          | N/A*                                                                         | N/A*                                                                 | N/A*                                             | ■                                                |
| Telephone jacks                                                                                  | 1                                                    | 1                                                    | 2                                                          | 1                                          | 1                                          | N/A*                                                                         | N/A*                                                                 | N/A*                                             | 1                                                |
| Speed dial presets                                                                               | 60                                                   | 80                                                   | 42                                                         | 50                                         | 50                                         | N/A*                                                                         | N/A*                                                                 | N/A*                                             | 94                                               |
| Fax software supplied                                                                            | Brother MFL<br>Pro                                   | PC Fax, 3D<br>FaxSpeed                               | Desktop<br>Manager                                         | HP Document<br>Assistant                   | HP Document<br>Assistant                   | N/A*                                                                         | N/A*                                                                 | N/A*                                             | Symantec Win-<br>Fax LITE 4.0                    |
| Fax while printing/scanning/copying                                                              | ■ ■ ■                                                | ■ ■ ■                                                | ■ ■ ■                                                      | ■ ■ ■                                      | ■ ■ ■                                      | N/A*                                                                         | N/A*                                                                 | N/A*                                             | ■ ■ ■                                            |
| <b>Scanning</b>                                                                                  |                                                      |                                                      |                                                            |                                            |                                            |                                                                              |                                                                      |                                                  |                                                  |
| Monochrome or color scanning (color depth)                                                       | Monochrome                                           | Color (24-bit)                                       | Monochrome                                                 | Monochrome                                 | Color (24-bit)                             | Color (24-bit)                                                               | Monochrome                                                           | Color (24-bit)                                   | Monochrome                                       |
| Highest optical-scan resolution                                                                  | 400 dpi                                              | 300 dpi                                              | 400 dpi                                                    | 300 dpi                                    | 300 dpi                                    | 300 dpi                                                                      | 300 dpi                                                              | 200 dpi                                          | 300 dpi                                          |
| Shades of gray                                                                                   | 256                                                  | 256                                                  | 256                                                        | 256                                        | 256                                        | 256                                                                          | 64                                                                   | 64                                               | 64                                               |
| OCR software included                                                                            | Brother MFL<br>Pro                                   | TextBridge                                           | TextBridge                                                 | OmniPage LE                                | OmniPage LE                                | OmniPage LE                                                                  | TextBridge                                                           | Pagis Pro 97                                     | TextBridge Pro                                   |
| Document-management software included                                                            | Brother MFL<br>Pro                                   | PaperPort                                            | Desktop<br>Manager                                         | HP Document<br>Assistant                   | HP Document<br>Assistant                   | None                                                                         | None                                                                 | Pagis Pro 97                                     | Pagis Pro 97                                     |
| <b>Copying</b>                                                                                   |                                                      |                                                      |                                                            |                                            |                                            |                                                                              |                                                                      |                                                  |                                                  |
| Rated speed                                                                                      | 5 ppm                                                | Monochrome,<br>4 ppm;<br>color, 2 ppm                | 1-3 ppm                                                    | 2 ppm                                      | 2 ppm                                      | Monochrome,<br>7 ppm;<br>color, 3 ppm                                        | 4 ppm                                                                | Depends on<br>CPU                                | 3 ppm                                            |
| Maximum number of copies                                                                         | 99                                                   | 99                                                   | 99                                                         | 99                                         | 99                                         | 50                                                                           | 20                                                                   | 99                                               | 99                                               |
| Maximum resolution                                                                               | 400 dpi                                              | 720 dpi                                              | 360 dpi                                                    | 600 dpi                                    | 600 dpi                                    | 600 dpi                                                                      | 600 dpi                                                              | 400 dpi                                          | 300 dpi                                          |
| Minimum reduction/Maximum enlargement                                                            | 50% / 200%                                           | 50% / 200%                                           | N/A*                                                       | 50% / 200%                                 | 50% / 200%                                 | 50% / 400%                                                                   | 10% / 200%                                                           | 50% / 400%                                       | 75% / 150%                                       |
| <b>Support</b>                                                                                   |                                                      |                                                      |                                                            |                                            |                                            |                                                                              |                                                                      |                                                  |                                                  |
| Toll-free technical support                                                                      | 8:30-7:00 M-F                                        | 8:30-7:00 M-F                                        | 8:00 A.M.-<br>10:00 P.M.<br>M-F,<br>noon-6:00 Sat.         | 8:00-8:00 M-F                              | 8:00-8:00 M-F                              | 8:00-8:00 M-F                                                                | 9:00-7:00 M-F                                                        | 8:00-8:00 M-F,<br>11:00-3:00 Sat.                | 8:00-8:00 M-F,<br>11:00-3:00 Sat.                |
| Warranty                                                                                         | 1 year                                               | 1 year                                               | 1 year                                                     | 1 year                                     | 1 year                                     | 1 year                                                                       | 1 year                                                               | 1 year                                           | 1 year                                           |
| Quick exchange under warranty                                                                    | 2 business days                                      | 2 business days                                      | 1 business day                                             | 1 business day                             | 1 business day                             | 1 business day                                                               | 2 business days                                                      | 1 business day                                   | 1 business day                                   |
| Web address                                                                                      | <a href="http://www.brother.com">www.brother.com</a> | <a href="http://www.brother.com">www.brother.com</a> | <a href="http://www.ccsi.canon.com">www.ccsi.canon.com</a> | <a href="http://www.hp.com">www.hp.com</a> | <a href="http://www.hp.com">www.hp.com</a> | <a href="http://www.hp.com/go/officejet_pro">www.hp.com/go/officejet_pro</a> | <a href="http://www.panasonic.com/alive">www.panasonic.com/alive</a> | <a href="http://www.xerox.com">www.xerox.com</a> | <a href="http://www.xerox.com">www.xerox.com</a> |

N/A\*—Not applicable: The product does not have this feature. N/A\*\*—Not applicable: This printer can print natively from DOS

Forward

Stop

Refresh

Home

Search

Favorites

History

Channels



Ad

http://www.micromedia.com/ie4/button

File

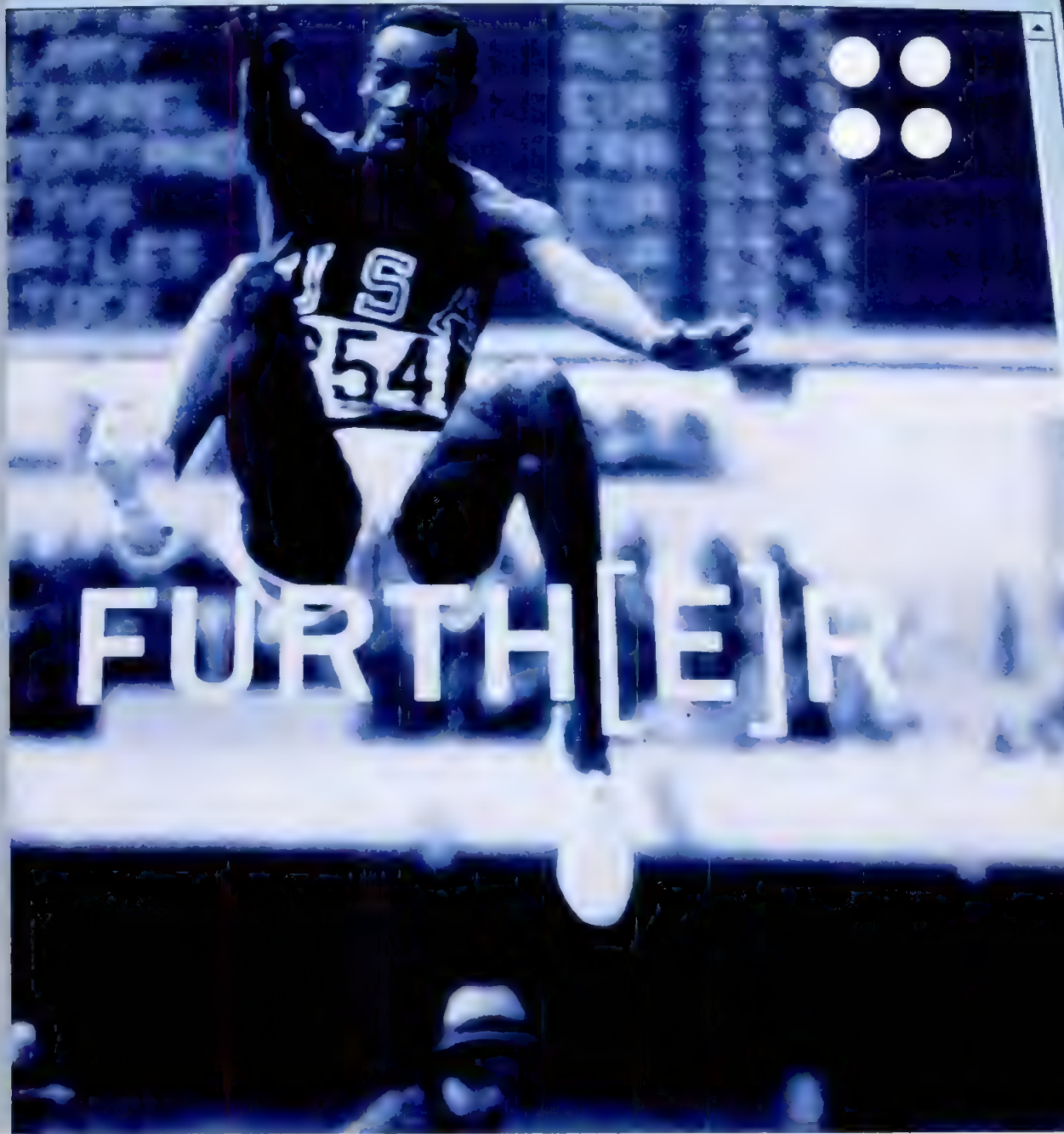
Edit

View

Go

Favorites

Help





quality was lackluster—about 175 dpi despite the 360-dpi rating. User control also is limited, with image reduction only available for 70, 80, and 90 percent.

The MultiPass does its job, despite our quibbles. If printing is your main focus, this unit may suffice.—WLR

**Canon Computer Systems Inc.**, Costa Mesa, CA; 800-848-4123, 714-438-3000; [www.ccsi.canon.com](http://www.ccsi.canon.com). Circle 473 on reader service card.

### HP OfficeJet 570, OfficeJet 630, OfficeJet 1150Cse

**OFFICEJET 570:** Legal-size four-color ink jet (also monochrome scanner, fax, and copier). Monochrome: 5 ppm, 600 dpi. Color: 2 ppm, 600 by 300 dpi. Windows only. \$550 street.

**OFFICEJET 630:** Legal-size 4-color ink jet (also color scanner, fax, color copier). Monochrome: 5 ppm, 600 dpi. Color: 2 ppm, 600 by 300 dpi. Windows only. \$600 street.

**OFFICEJET 1150CSE:** Legal-size 4-color ink jet (also color scanner, color copier). Monochrome 8 ppm, 600 dpi. Color: 4 ppm, 600 by 300 dpi. \$900 street. Though they don't provide the most seamless integration of printing, faxing, scanning and copying, these HP machines have their own clunky way of getting the job done. Slightly more expensive than some other units, they deliver a correspondingly above-average feature set—and the high-end OfficeJet 1150Cse includes an admirable range of functions.

The OfficeJet 570 is designed for budget-minded home and SOHO buyers. It will satisfy users who need a multifunction device but don't need color scanning or top-quality output. Installation is uncharacteristically cumbersome for an HP device, involving a rigorous hardware and software setup procedure. You can dial, fax, and copy directly from the hardware, but the preferred mode of operation is to use the bundled software, HP OfficeJet Manager, which has animated images that, while helpful at first, quickly grow tiresome.

The copier reduces to 50 percent and enlarges to 200 percent, but only through software control. It also can collate jobs of up to 99 pages, the limit of the output tray. The scanner has a mechanical resolution of 300 dpi and can deliver the same to electronic files, but hard copy on our tests consistently measured about 200 dpi.

One unfortunate “innovation” is that the OfficeJet 570 is built with a single motor for coordinating input and output paper paths. As a result, the machine scans as much as possible to your PC's memory before committing anything to paper or fax. The scan and print functions can't operate simultaneously, and during testing we discovered that we couldn't print out

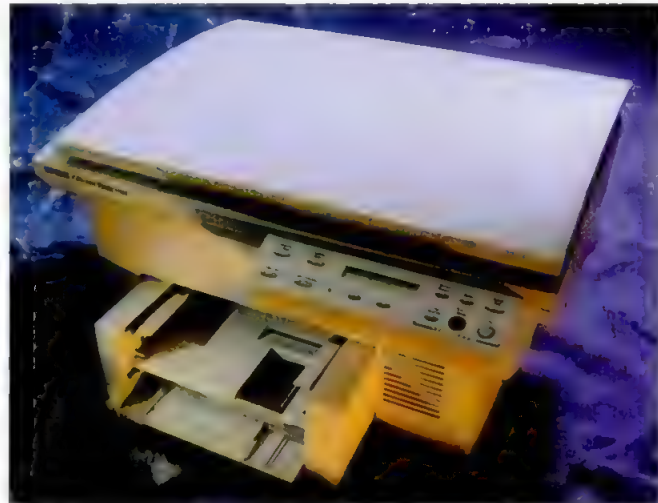
while the unit was faxing—even when faxing from memory. The OfficeJet may be multifunction, but it certainly isn't multitasking.

Print quality is acceptable, but close examination shows bleeding around text characters on plain paper. Spot color is rich, with good coverage, though large areas of color show some banding. On our fax tests, the 570 consistently stretched our single test page onto a second sheet, causing an unnecessary delay. Print speed was in the middle of the pack.

Somewhat underpowered, the OfficeJet 570 still does what you ask of it. It's an acceptable rather than an exemplary performer.

If you're happy with the 570's level of output quality and response but you want color-scanning capability to boot, the OfficeJet 630 might be a better pick: It is essentially the same machine as the 570, but it has 24-bit color-scanning (and hence color-copying) capabilities instead of 8-bit gray-scale. The 630 also adds extra utilities for color scanning, and it can store 65 fax pages in memory (compared with 45 for the 570).

On our tests, everything the 570 could do, the 630 did similarly, though slower. We also found that the rated copy speeds were overly optimistic; a high-quality color copy took more than 10 minutes to finish. While the printout was colorful and attractive, you'd never mistake the copy for the original. The color-scanning capability is a bonus worth having, but the 630 rates the same as its sibling:



Best viewed as a low-volume office color copier and printer with color scanning as a bonus, the HP OfficeJet 1150Cse is a good choice.

competent, not spectacular.

HP's high-end OfficeJet 1150Cse looks more like a classic copier than a printer: It's built around a copier chassis that contains a four-color ink jet print engine. Duty-rated at a moderate 1000 pages per month, it will do fine in a small office that does a lot of business-quality scanning. Note that it does not include faxing capabilities.

The OfficeJet 1150Cse's 100-sheet input tray accommodates paper ranging from index cards to legal-size sheets, and a special slot above the paper tray allows you to feed envelopes manually. The small control panel has a 16-digit LCD screen and a dozen buttons that allow you to select from three quality levels (draft, normal, and best), which trade off speed for detail. Draft mode is essentially superfluous, with very little difference in quality or speed from normal mode.

The scanner/copier flatbed allows you to reproduce bulky objects (such as pages from *PC Magazine*) up to 11.75 inches long. Despite the claimed resolution of 1,200 dpi interpolated, the quality of scanned images is well below average for the machines in this roundup.

HP's scanner software, while simplifying operation to some extent, actually limits user control and customization options. Using the copier is a bit convoluted, because there's no numeric keypad. You'll have to wade through menus to get the reduction (to 50 percent) or enlargement (to 400 percent) you want. A



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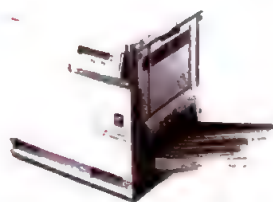
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# MFP Output: Not Bad, but Not Great

*While output quality from standalone ink jet printers falls in a fairly narrow range, we found more variability among the nascent color multifunction printers.*

The two laser-based multifunction printers we tested—the Brother MFC-4550 and the Panasonic KX-PS600—did a fine job with our newsletter test file (a Microsoft Publisher document). Text was, of course, dark and laser-crisp. The photo image retained detail in the shadow areas and showed good tonality for 600-dpi laser devices.

Output from the ink-jet multifunction machines was more disparate. The Brother MFC-7000FC (our Editors' Choice) and the HP OfficeJet 1150Cse did the best jobs

reproducing the color photo on plain paper, producing accurate and pleasing skin tones. The budget-priced Canon MultiPass C3000 and Xerox Document HomeCentre also produced creditable output, especially considering their \$500 price tags.

Color photo output from the HP OfficeJet 570 and OfficeJet 630 showed more dottiness than with the higher-end OfficeJet. Colors were well saturated, however, and business graphics output is fine for day-to-day SOHO tasks.

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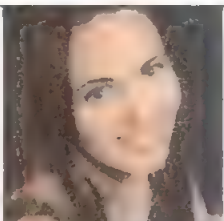


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**Brother MFC-4550**  
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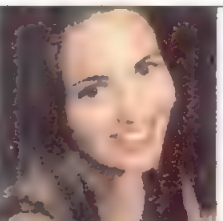


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**Brother MFC-7000FC**  
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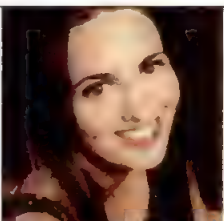


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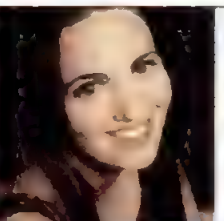


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**HP OfficeJet 570**  
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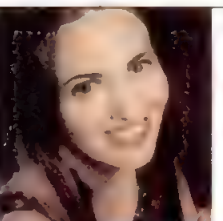


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**HP OfficeJet 630**  
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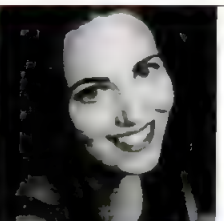


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**HP OfficeJet 1150Cse**  
600-dpi ink jet  
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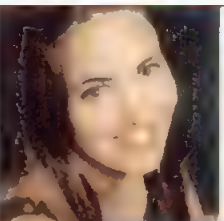


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**Panasonic KX-PS600**  
600-dpi laser  
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**Xerox HomeCentre**  
300-dpi ink jet  
\$500 street

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**Xerox Document WorkCentre 450c**  
600-dpi ink jet  
\$550 street

Nancy Ross: M  
Football Coach S

**Partners**

The Microsoft Windows PC  
**Series**

**?**

**Windows NT  
Workstation:**  
*Is it right for your  
size business?*

**Inside:**



In the market for a new business PC?

Why pre-installed Microsoft Windows NT Workstation  
is your best business move yet.



If there's one thing to be learned from the explosive growth in the number of small businesses, it's that size and success aren't necessarily related. Given the right tools, a small business can perform just like a big business. The bottom line? You don't have to be big to do big things.

Keeping that in mind, Microsoft—with our PC partners Dell, Digital, IBM, and others—has created a business computing solution that can change the way businesses of all sizes work and succeed. It's Windows NT pre-installed on new PCs.

We can guess your next question: "Isn't Windows NT just for enterprises?" The fact is, no it's not. We believe Windows NT is the world's most powerful business operating system. And small businesses everywhere are using this power on new PCs with big results. Why did they choose Windows NT Workstation? Here's what they told us.

## **"Windows NT allows my small company to do the work of a large company."**

—Arabian, Hypnotic Fx

**Windows NT Workstation is dependable.** "Small businesses are no different from big corporations in one important respect," says Alton Loe of OSI. "Our computers need to run just as dependably. That's why we like Windows NT. It's bulletproof." Greg Hillenbrand of Fourth Shift concurs. "For us, running Windows NT on IBM ThinkPads was a no-brainer. We've been using ThinkPads for four years—but with Windows NT, we were suddenly able to do things we'd never done before. Windows NT is safe. It's stable. It doesn't disappoint us."

**Windows NT keeps your data safe and secure even under the very toughest conditions.** Ever accidentally leave your laptop in a cab? Or find out that someone who shouldn't have accessed your files did? We have, too. That's why Windows NT includes integrated security. This way more than one person can use the same personal computer, but each has access only to his or her individual files. "The key reasons we had Windows NT pre-installed on our new PCs was its security and scalability," says Mike Stone, Stan Wiley Realtors. "In our business, data integrity is paramount. Windows NT allows us to guarantee complete customer privacy, as only agents with a need to know can access customer information—even on our shared PCs."

**Windows NT is not complicated.** Windows NT features the same familiar user interface that is in the Windows 95 operating system. "The Windows NT user interface makes everything easy," says Leoung O'Young of Digimata. "We just finished a project that, just a few years ago, we couldn't have even attempted. But now that we have a Digital Personal Workstation running

Windows NT, we can take on big projects and really deliver." Jan Denson of Pillsbury Madison Sutro LLT agrees, having recently migrated the firm to a Dell OptiPlex PC and Windows NT environment. "It hasn't been hard at all to learn Windows NT—and we've got people here who, five hours before they got their system, didn't even know what a mouse was. A little bit of training, and they're up and running. That's how easy Windows NT is."

**Windows NT is a multitasking wonder.** What about doing multiple tasks at once? Windows NT preemptive multitasking allows you to work fast and furiously in several applications at the same time without worrying about overloading the system. "Windows NT task switching is ... bam! It's immediate," says Loe. "Windows NT runs every application in a separate memory space, so it's like having a virtual machine for each task."

**Windows NT turns you into a brilliant manager of files, folders, applications—and time.** Hate filing? That's okay. Windows NT presents a view of information that makes browsing and managing files, drives, and network connections easy—and your time even more productive. "We're able to get more work done in less time; we know the status of everything. And with our Digital Personal Workstation, the 3-D work really screams," says Arabian, owner of Hypnotic Fx.

**Yes!**  
**Windows NT**  
**Workstation**  
**is right for**  
**businesses**  
**of all sizes.**

**Windows NT saves big bucks.** Industry analysts report that running Windows NT costs a lot less than running Windows 3.1.\* And don't forget the time saved by not calling technical support and how much more work your firm can accomplish—and bill—due to increased productivity. "When you consider the return on investment," adds Loe, "you've really got to ask yourself, can I afford not to go with Windows NT?"

**Windows NT is the best way to move your business into the future: a 32-bit world.** Besides increased security, better performance, bulletproof reliability, and reduced costs, what else can a 32-bit operating system like Windows NT offer? Well, how about the satisfaction of a secure investment? As Denson points out, "We did the research, and it was clear to us that 32-bit was the only way to go. This was a strategic decision—our goal was to buy on the forward edge of technology." What did their research tell them? "All indicators pointed to a 32-bit environment running Windows NT."

**Windows NT has a way of helping businesses of all sizes accomplish one important task: success.** "It's funny," summarizes Arabian. "A lot of people think Windows NT is just for large businesses, but I think it's actually the other way around. Windows NT is the way in. Being successful has little to do with size and everything to do with how quickly you move. And I can tell you this much: With Windows NT, we're moving pretty fast."



## From our partners

**Dell: built for your business.** At Dell, we talk with thousands of business customers every day, and this is what we've heard. You want a powerful machine that won't become obsolete within a year (or even five). You want it configured for your specific needs. And you want it at a fair price. How do we respond to these requests? With one word: OptiPlex.



The OptiPlex system, like all of our other offerings, isn't something we pull from stock. We build it in the exact configuration you want, fully loaded with the software you spec, from the ground up. Today, more businesses are requesting OptiPlex computers pre-loaded with Windows NT Workstation than ever before, and we think that's smart. Windows NT is a powerfully robust system, and we should know—our validation lab puts it through its paces every day. But our partnership with Microsoft goes well beyond meetings and tests. We're also working with it to create a computing road map designed to give you the ability to see further. Like all the way to the future. Long before it arrives.

**Digital: approaching warp speed.** At Digital, we see a tremendous opportunity for businesses of all sizes to sharpen their competitive edge by moving to powerful Windows NT-based workstations. Built for the demanding design professional, our Digital Personal Workstations can drive down costs, improve productivity, and help you harness the latest, most innovative 32-bit applications. And the results are impressive.



Digital Personal Workstations unleash the true power of Windows NT Workstation to help users visualize their creations faster and more realistically. At the same time, they offer access to state-of-the-art office and personal productivity tools. It all adds up to faster time to market. Even better, the combination of Digital Personal Workstations and Windows NT offers a total cost of ownership that is 39 percent lower than that of UNIX workstations, according to a study conducted by Deloitte and Touche. See what we mean? Impressive results. And exactly what you would expect from a powerful alliance between two market leaders: Digital and Microsoft.

**IBM: think smart.** At IBM, we're dedicated to helping our customers get the most out of their computing solutions, and our ThinkPads are a perfect example. Working closely with Microsoft, we designed all our ThinkPads to take on the very real challenge of running Windows NT Workstation on a notebook computer—and we're happy to report that the long hours have resulted in a smashing success.



Today, while all our ThinkPads run Windows NT, the IBM ThinkPad 770 provides what we believe is the industry's premier Windows NT Workstation implementation in a mobile platform. Every ThinkPad 770 features, among other things, full power management, Ultrabay Plug and Play, and hot plug PC Card support. Bottom line? Our customers can take advantage of Windows NT security, scalability, and reliability at 35,000 feet as easily as they can on their desktop system back at the office. Flexibility through partnership. At IBM and Microsoft, it's what we think small businesses need to succeed.

For more information on  
Microsoft's partnership  
approach to Windows NT  
business computing,  
visit: [www.microsoft.com  
/windows/newtech/](http://www.microsoft.com/windows/newtech/)

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Microsoft Small  
Business computing,  
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Windows NT and Windows 95

**Microsoft**

[www.microsoft.com/smallbiz](http://www.microsoft.com/smallbiz)

draft-quality copy requires about 20 seconds for a black-only page. For top-quality color, however, expect to wait nearly 4 minutes.

During testing, the 1150Cse proved to be the fastest ink jet-based multifunction printer, though it was only about half the speed of the laser machines. Output quality on plain paper is where the OfficeJet 1150Cse really shines. Text is dark and well formed, and color graphics print with saturated colors, with just a hint of banding on large areas of color.

The OfficeJet 1150Cse is best understood as an easy-to-use, light-duty flatbed color copier and printer, with scanning capabilities on the side. It's a competent machine, though outshone by the Brother MFC-7000FC.—WLR

**Hewlett-Packard Co.**, Palo Alto, CA; 800-752-0900, 208-323-2551; www.hp.com. Circle 475 on reader service card.

## Panasonic KX-PS600

*Legal-size monochrome laser (also monochrome scanner and copier). 6 ppm, 600 dpi. Windows only. \$600 street.*

Easy to use and simple in design, the Panasonic KX-PS600 grafts a monochrome scanner onto a basic laser printer, creating a copier from the combination. Targeted squarely at SOHO and business users who already have dedicated fax machines, it delivers respectable output quality at admirable speeds.

Operating this tower-shaped unit is simple and hassle-free once you fold out the three paper trays to their various angles. Other than the power switch, a single button—Copy—is the only control. A door on the right of the tower gives wide-open access to the toner and drum as well as the paper path.

You can load up to 100 sheets of let-

ter- to legal-size paper (or up to 10 envelopes) into the input tray; they emerge image-down, automatically collated, at the top of the printer. The scanner and copier accept up to 20 sheets via a different paper path, which outputs the prints into a separate area.

The Panasonic scanning software follows the same minimalist approach as the rest of the machine, with two resolutions (200 and 300 dpi) and three bit depths (text, photo and "ultra"). Optimized for OCR with Xerox's TextBridge OCR, the software lacks prescan or image manipulation abilities.

The KX-PS600 generates good laser-quality output at true 600 dpi and at page-printer speed. Photocopies look crisp, and they're fast, too: A single copy took about 25 seconds in our labs. Scans, however, were disappointing, with no true gray-scale and resolution that fell

## PERFORMANCE TESTS

# Multifunction Printers



Not surprisingly, the two laser-based multifunction printers outpaced the ink jet units on our speed tests.

## How We Tested

The **Microsoft Word** test prints a five-page black-and-white text document that uses different fonts and type sizes.

The **Microsoft Excel** test prints a two-page spreadsheet with line graphs, bar graphs, and pie charts. We ran the document in both monochrome mode and, for units that offered color printing, color mode.

The **Microsoft Publisher** test prints a one-page newsletter containing

text, graphics, and a bitmapped photo image. We ran the document in both monochrome mode and, for units that offered color printing, color mode.

The **Freelance Graphics** test prints a three-page color slide presentation containing pie charts, bar graphs, and a bitmapped photo image on a gradient-filled background. This is a color-intensive document designed for color printers, so we did not run the test on monochrome-only units.

The **Adobe Photoshop** test prints a one-page photographic bitmapped image. We ran this test only on color-capable units.

We tested on a Micron Millennia P200 with 32MB of RAM, a 2.1GB Western Digital Caviar hard disk, and an 8X Hitachi CD-ROM drive. We ran each of the speed tests twice, and we present the average scores in the chart.

We used the default print setting within each application, and we chose the most appropriate mode for printing that type of job.

| Bold type denotes first place<br>Minutes:seconds | Microsoft Word<br>(monochrome) | Microsoft Excel<br>(monochrome) | Microsoft Excel<br>(color) | Microsoft<br>Publisher<br>(monochrome) | Microsoft<br>Publisher<br>(color) | Freelance<br>Graphics<br>(color) | Adobe<br>Photoshop<br>(color) |
|--------------------------------------------------|--------------------------------|---------------------------------|----------------------------|----------------------------------------|-----------------------------------|----------------------------------|-------------------------------|
| Brother MFC-4550                                 | <b>1:08</b>                    | 0:39                            | N/A                        | 0:39                                   | N/A                               | N/A                              | N/A                           |
| Brother MFC-7000FC                               | 2:33                           | 0:52                            | <b>1:01</b>                | 0:46                                   | <b>0:58</b>                       | 3:00                             | 7:47                          |
| Canon MultiPass C3000                            | 2:49                           | 1:14                            | 3:20                       | 1:08                                   | 3:20                              | 4:26                             | 6:21                          |
| HP OfficeJet 570                                 | 3:16                           | 1:52                            | 3:57                       | 1:27                                   | 2:40                              | 4:44                             | 8:10                          |
| HP OfficeJet 630                                 | 3:22                           | 1:54                            | 4:21                       | 1:28                                   | 2:49                              | 4:56                             | 9:00                          |
| HP OfficeJet Pro 1150Cse                         | 1:51                           | 1:28                            | 2:13                       | 1:12                                   | 1:45                              | <b>2:29</b>                      | <b>4:00</b>                   |
| Panasonic KX-PS600                               | 1:13                           | <b>0:34</b>                     | N/A                        | <b>0:26</b>                            | N/A                               | N/A                              | N/A                           |
| Xerox Document HomeCentre                        | 5:09                           | 3:01                            | 3:21                       | 2:07                                   | 2:13                              | 5:55                             | 17:41                         |
| Xerox Document WorkCentre 450c                   | 5:33                           | 3:01                            | 3:44                       | 2:06                                   | 2:27                              | 6:49                             | 5:04                          |
|                                                  | ◀ BETTER                       | ◀ BETTER                        | ◀ BETTER                   | ◀ BETTER                               | ◀ BETTER                          | ◀ BETTER                         | ◀ BETTER                      |

N/A—Not applicable. This unit does not print in color.



far short of the 300-dpi claim. Still, the KX-PS600 is a good choice if your primary interest is laser printing for text and you need occasional OCR scanning and copying.—WLR

**Panasonic Computer Peripheral Co.**, Secaucus, NJ; 800-742-8086, 201-348-7000; [www.panasonic.com/alive](http://www.panasonic.com/alive). Circle 479 on reader service card.

## Xerox Document HomeCentre, Document WorkCentre 450C

**HOME CENTRE:** Legal-size four-color ink jet (also color scanner, color copier). Monochrome: 4 ppm, 600 dpi. Color: 1 ppm, 300 dpi. Windows only. \$500 street.

**WORK CENTRE 450C:** Legal-size four-color ink jet (also monochrome scanner, fax, and copier). Monochrome: 6 ppm, 600 dpi. Color: 1 ppm, 600 dpi. \$550 street.

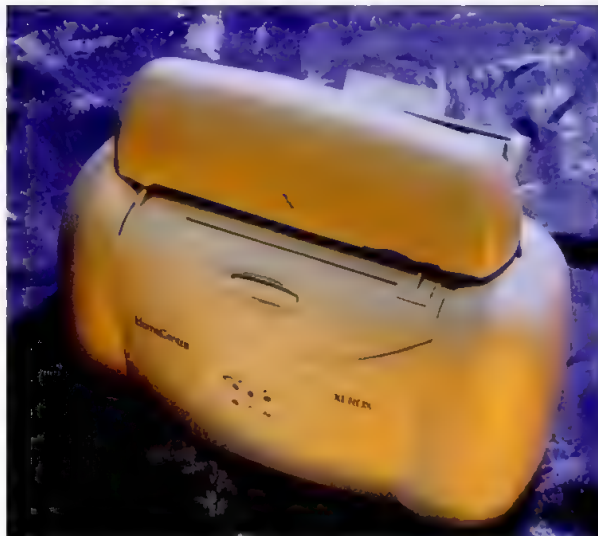
Clever design and simple operation characterize these new multifunction devices from Xerox. Their contrasting sets of features, designed for two distinct markets, share only one frustrating flaw: slow performance.

The family-oriented Document HomeCentre is a great buy for home users who want to print, copy, and scan, all in color—and who don't mind waiting a while for prints to ease their way out of the machine. Its capabilities match those of high-end competitors like the HP OfficeJet Pro 1150Cse (\$900 street), but its design is more appealing and the price is much lower. Note that there are no fax capabilities.

The curvy, robotlike styling actually integrates two pieces: a printer base and a detachable scanner that sits on top. When set in place, the scanner whisks single sheets through like a conventional page scanner, with 400-dpi optical resolution in monochrome and 200-dpi in color. Remove the scanner from its base and you have a wide-body, letter-size, hand-held scanner to digest books and other thick, flat objects.

Inside the base chassis is a four-color ink jet printer that uses a separate cartridges for each color, or a large monochrome-only cartridge for increased capacity and performance. Sheets ranging from 4 by 6 inches to legal size slide into the 100-sheet lower tray and come out image-up on the 35-sheet upper rear output tray.

Although the capacity of the copier is



The Xerox Document HomeCentre features a detachable color scanner and good color output.

like that of a larger machine—up to 99 copies, with reduction to 50 percent and enlargement to 400 percent—you won't want to rely on the HomeCentre for big jobs, because they require frustrating software intervention. But making a single copy is simple: You just scan, adjust the image, then press print to make the copy.

Output on our tests was more than acceptable for a printer in this class, with solid, well-formed characters even on plain paper. Colors were a little washed on plain paper but vibrant on better ink jet stock. In speed testing, the HomeCentre's printer performance was disappointing, among the slowest of all the multifunction machines.

Still, the HomeCentre is an innovative and amazingly affordable color printer that also can scan and copy—and would be at home with most families who don't mind waiting a bit for prints.

As well tuned as the HomeCentre is for families, the Document WorkCentre 450C is a more problematic offering for its target audience of small-office users. Although it offers an impressive collection of office functions (color printing, monochrome scanning and copying, faxing), they don't quite pull together in normal operation, and output speed is markedly sluggish.

Several features work well, however. The full-featured control panel allows you to fax or copy without ever plugging into your PC, so you can use the unit as a

standalone device. But forgo the software and you'll lose out on some other capabilities, including a wider range of document enlargement and reduction. The print engine uses the same ink tank system as in the HomeCentre, including a separate cartridge for each of the four colors, plus an alternative, large-capacity black-only cartridge.

As a text copier, the WorkCentre produces high-quality output and generates a page in about 45 seconds. Originals slip through at about the same rate when you're making

black-and-white scans. If you switch to gray-scale graphics, however, you can expect a wait of over 6 minutes per page. The paper path is short, but it takes a sharp U-turn around the print head, with output emerging image-up—so multi-page copies have to be collated manually.

During testing, we noticed some minor but disconcerting problems. For starters, setting the copy size to 100 percent caused a single letter-size document to stretch over two pages because of the gripping area/margin required at the top of the page.

The Xerox Pagis Pro 97 software also suffers from its simplicity by denying the user sufficient control. It has no prescan option, for example, and it allows scans only in black and white or just 16 shades of gray (not 256), which means copies from this unit lack subtle shading. And printing is slow, slower even than with the HomeCentre, posting the longest time in our roundup on three out of seven application tests.

While it has more than an ample share of office features, the Document WorkCentre 450C seems a bit too haphazard when actually put to use. Savvy business users would do well to check out the competition before buying this attractively designed yet inconsistent product.—WLR

**Xerox Corp.**, Palo Alto, CA; 800-832-6979; [www.xerox.com](http://www.xerox.com). Circle 480 on reader service card. **PC**

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If you're ready to add a real edge to the way you do business, you're ready for the MFC-7000 Color Multi-Function Center™. That's because it's designed to take full advantage of the most important weapon in your professional arsenal...color. From its high resolution color printer, color copier and color scanner to its unique ability to send color faxes, our MFC-7000 gives your image all the color edge it needs—right at your fingertips. Speaking of image, its exclusive built-in video-capture function lets you capture images from a VCR, camcorder or digital camera. Combine that with a full feature plain paper fax and a digital message center, and you can see why the MFC-7000 will work for you... in color...and in more ways than one.

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Reduce and enlarge  
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Send and receive  
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Send color faxes to  
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Capture video frames  
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\* Interpolated resolution (300 x 300 dpi optical)  
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CIRCLE 208 ON READER SERVICE CARD





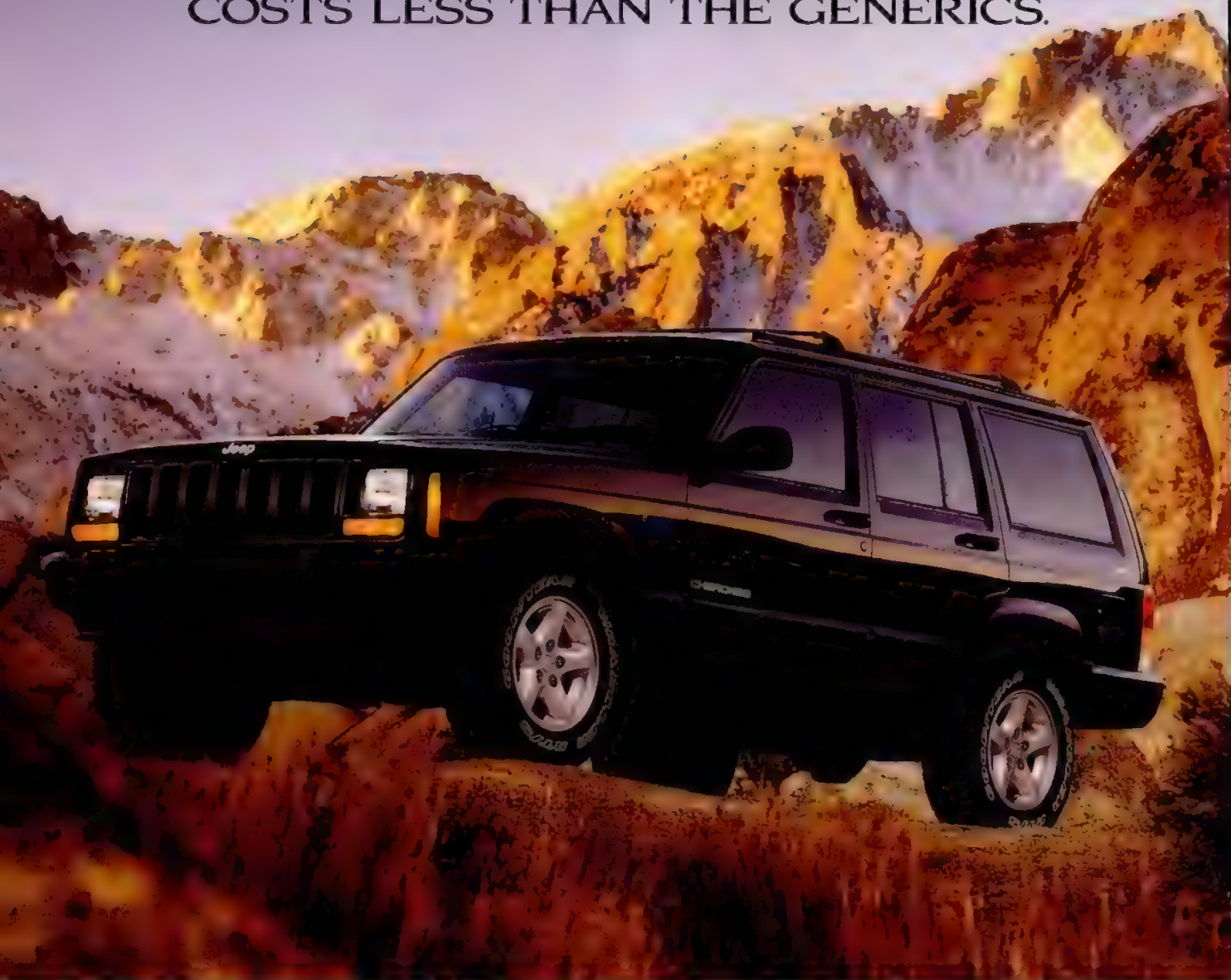


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T H E R E ' S   O N L Y   O N E

# Service & Reliability

Printer vendors are crowing about rock-solid reliability and great customer service. Here's what 8,500 *PC Magazine* readers say.

By *Samantha J. Edwards*

| Readers' Report Card |                                                                        |          |                                                                 |
|----------------------|------------------------------------------------------------------------|----------|-----------------------------------------------------------------|
| <b>A</b>             | Epson<br>Hewlett-Packard                                               | <b>C</b> | Digital<br>Okidata<br>Tektronix<br>Xerox                        |
| <b>B</b>             | Apple<br>Canon<br>IBM<br>Lexmark<br>NEC<br>Panasonic<br>Star Micronics | <b>D</b> | Brother<br>Citizen America<br>QMS<br>Tandy<br>Texas Instruments |

## How Readers Rated Printer Vendors

☒ Significantly better than average
 ☐ Average
 ☒ Significantly worse than average

| Vendor<br>(number of responses) | SATISFACTION WITH:                   |                                      |                                      |                                      | Buy again?                           |
|---------------------------------|--------------------------------------|--------------------------------------|--------------------------------------|--------------------------------------|--------------------------------------|
|                                 | Reliability                          | Repair                               | Tech support                         | Units needing repair                 |                                      |
| <b>Apple</b> (267)              | <input checked="" type="radio"/> 8.4 | <input type="radio"/> 7.8            | <input type="radio"/> 7.4            | <input type="radio"/> 21%            | <input type="radio"/> 6.8            |
| <b>Brother</b> (215)            | <input type="radio"/> 8.3            | <input checked="" type="radio"/> 6.9 | <input type="radio"/> 7.3            | <input type="radio"/> 23%            | <input checked="" type="radio"/> 7.4 |
| <b>Canon</b> (1,306)            | <input type="radio"/> 8.3            | <input type="radio"/> 7.7            | <input type="radio"/> 7.6            | <input checked="" type="radio"/> 16% | <input checked="" type="radio"/> 7.9 |
| <b>Citizen America</b> (105)    | <input checked="" type="radio"/> 7.7 | <input type="radio"/> 7.2            | <input type="radio"/> 7.6            | <input type="radio"/> 15%            | <input checked="" type="radio"/> 5.5 |
| <b>Digital</b> (109)            | <input type="radio"/> 7.6            | <input type="radio"/> 7.1            | <input type="radio"/> 6.9            | <input type="radio"/> 27%            | <input checked="" type="radio"/> 6.1 |
| <b>Epson</b> (1,922)            | <input checked="" type="radio"/> 8.6 | <input checked="" type="radio"/> 8.1 | <input checked="" type="radio"/> 8.1 | <input checked="" type="radio"/> 11% | <input checked="" type="radio"/> 7.9 |
| <b>Hewlett-Packard</b> (8,219)  | <input checked="" type="radio"/> 9.2 | <input checked="" type="radio"/> 8.8 | <input checked="" type="radio"/> 8.7 | <input checked="" type="radio"/> 15% | <input checked="" type="radio"/> 9.3 |
| <b>IBM</b> (322)                | <input checked="" type="radio"/> 8.4 | <input checked="" type="radio"/> 7.9 | <input checked="" type="radio"/> 7.9 | <input checked="" type="radio"/> 24% | <input type="radio"/> 7.1            |
| <b>Lexmark</b> (469)            | <input checked="" type="radio"/> 8.5 | <input checked="" type="radio"/> 7.9 | <input checked="" type="radio"/> 8.0 | <input type="radio"/> 21%            | <input type="radio"/> 7.1            |
| <b>NEC</b> (189)                | <input type="radio"/> 8.3            | <input type="radio"/> 7.2            | <input type="radio"/> 7.1            | <input checked="" type="radio"/> 15% | <input type="radio"/> 6.7            |
| <b>Okidata</b> (578)            | <input type="radio"/> 8.3            | <input type="radio"/> 7.6            | <input type="radio"/> 7.6            | <input type="radio"/> 23%            | <input checked="" type="radio"/> 7.2 |
| <b>Panasonic</b> (950)          | <input checked="" type="radio"/> 8.5 | <input type="radio"/> 7.7            | <input type="radio"/> 7.7            | <input checked="" type="radio"/> 12% | <input type="radio"/> 7.1            |
| <b>QMS</b> (99)                 | <input type="radio"/> 7.9            | <input type="radio"/> 6.8            | <input type="radio"/> 6.7            | <input checked="" type="radio"/> 37% | <input checked="" type="radio"/> 6.2 |
| <b>Star Micronics</b> (143)     | <input type="radio"/> 8.2            | <input checked="" type="radio"/> 7.6 | <input checked="" type="radio"/> 7.5 | <input checked="" type="radio"/> 8%  | <input checked="" type="radio"/> 5.8 |
| <b>Tandy</b> (70)               | <input checked="" type="radio"/> 6.9 | <input type="radio"/> 6.5            | <input checked="" type="radio"/> 5.8 | <input type="radio"/> 21%            | <input checked="" type="radio"/> 4.4 |
| <b>Tektronix</b> (143)          | <input type="radio"/> 8.1            | <input type="radio"/> 7.4            | <input checked="" type="radio"/> 8.2 | <input checked="" type="radio"/> 40% | <input checked="" type="radio"/> 7.7 |
| <b>Texas Instruments</b> (103)  | <input type="radio"/> 7.8            | <input type="radio"/> 7.3            | <input type="radio"/> 7.2            | <input checked="" type="radio"/> 38% | <input type="radio"/> 6.5            |
| <b>Xerox</b> (84)               | <input type="radio"/> 8.3            | <input type="radio"/> 7.9            | <input type="radio"/> 7.6            | <input type="radio"/> 27%            | <input type="radio"/> 7.7            |

**Y**ou can study the output samples, tally the features, compare the speeds, and check the prices for the 45 printers reviewed in the preceding pages nine ways to Sunday. But you're still not ready to make a final buying decision until you've seen how our readers feel about products they have purchased in the past. How reliable have the printers been? How good are a vendor's repair and technical-support operations? And perhaps most telling: Are users likely to buy a printer from the same manufacturer again?

For each of the past six years, *PC Magazine* has surveyed readers and asked them to rate the printers they have used in terms of their satisfaction with overall reliability, repair experience, and technical support, and also to indicate the number of repairs needed in the preceding 12 months. We use these four measures to determine each vendor's grade on our Readers' Report Card. We also asked readers to indicate the likelihood of their buying a printer from the same vendor again. (We present



## Vendor Grades Past And Present

|                   | 1997 | 1996 | 1995 |
|-------------------|------|------|------|
| Apple             | B    | B    | B    |
| Brother           | D    | D    | C    |
| Canon             | B    | B    | A    |
| Citizen America   | D    | C    | C    |
| Digital           | C    | C    | B    |
| Epson             | A    | A    | A    |
| Hewlett-Packard   | A    | A    | A    |
| IBM               | B    | N/A  | N/A  |
| Lexmark           | B    | B    | B    |
| NEC               | B    | D    | C    |
| Okidata           | C    | D    | B    |
| Panasonic         | B    | B    | B    |
| QMS               | D    | D    | C    |
| Star Micronics    | B    | B    | B    |
| Tandy             | D    | C    | D    |
| Tektronix         | C    | D    | D    |
| Texas Instruments | D    | D    | C    |
| Xerox             | C    | C    | N/A  |

N/A—Not applicable. We did not receive 50 responses for this vendor, the minimum needed for inclusion in our survey results.

the vendors' scores for all five measures in the accompanying chart "How Readers Rated Printer Vendors.")

This year we received responses from 8,500 subscribers. To be certain that our results are statistically significant, we include on our Report Card only vendors for which we received at least 50 responses. We have tabulated the results for 18 printer vendors and almost 16,000 printers. Using advanced statistical methods (you know, like the ones in the course that kept you off the dean's list that semester), we were able to determine whether a vendor's score in each category was significantly above average, average, or significantly below average. Note that two raw scores that look similar on the table may translate into different rankings, because the number of responses and other factors taken into account by our statistical methodology affect the result. (For a more detailed explanation, see the sidebar "How We Surveyed.")

### MAKING THE GRADE

To merit a grade of A, a vendor had to receive better-than-average scores on all four of the key measures described

above. This year, Epson and Hewlett-Packard achieve this high standard. They are the only vendors to receive top grades for three years running (see the chart "Vendor Grades Past and Present"). Hewlett-Packard, the industry giant, accounts for more than half of the 16,000 printers cited by our readers. The nearest vendor in this respect is Epson, which receives 12 percent of the mentions in the survey.

The B grade, representing a combination of better-than-average and average scores, is received by seven of the vendors—Apple, Canon, IBM, Lexmark, NEC, Panasonic, and Star Micronics. This number is larger than in previous years.

IBM is a new entry on the survey. It makes a very good first showing, earning an above-average score in the "satisfaction with technical support" category. IBM's scores on the other three measures are average. NEC, which battled with a D last year, jumps to a B this time around, improving on two of the four measures (satisfaction with repair experience and the number of repairs needed in the past 12 months).

Apple continues to hold onto a B grade, but not without some shifts in its scores. Last year, the company received average scores except for its better-than-average score for repairs in the past 12 months, whereas this year reader satisfaction with overall reliability is above average.

As for the other vendors, Canon retains its B grade, but its scores for satisfaction with overall reliability and satisfaction with repair experience have both fallen from better than average to average. Lexmark receives better-than-average scores on all of the measures except repairs in the past 12 months (in which it is rated average), mirroring last year's results. Panasonic's scores have also remained consistent, with better-than-average scores for satisfaction with overall reliability and repairs in the past 12 months, while the other two grades remains average. Star Micronics, another vendor whose scores have remained

consistent, receives average grades on the satisfaction measures and a better-than-average score for repairs in the past 12 months.

A grade of C indicates that a vendor has received either average scores in all categories or a combination of better-than-average, average, and worse-than-average scores. Four vendors earn a C this year: Digital, Okidata, Tektronix, and Xerox. Digital stays average on all four measures. Okidata improves from worse than average to average for repairs in the past 12 months, raising itself from the grade of D it earned last year. Tektronix also shows improvement from its D last year, with its score for satisfaction with technical support moving from average to better than average. Xerox maintains its grade of C from last year, while its score for repairs in the past 12 months improves from worse than average to average, and satisfaction with repair experience has dropped from better than average to average.

The D grade, the lowest on our survey results again this year, reflects a combina-

## How Long Will You Wait on Hold?

We asked readers to report the average time they spent on hold during a technical-support call before being connected to a live person.

- Significantly better than average
- Average
- Significantly worse than average

|                   | Minutes on hold |
|-------------------|-----------------|
| Apple             | ○ 13.6          |
| Brother           | ○ 10.5          |
| Canon             | ● 13.9          |
| Citizen America   | ○ 6.3           |
| Digital           | ○ 13.6          |
| Epson             | ○ 11.5          |
| Hewlett-Packard   | ▲ 8.3           |
| IBM               | ○ 9.8           |
| Lexmark           | ○ 9.3           |
| NEC               | ○ 15.1          |
| Okidata           | ○ 8.7           |
| Panasonic         | ○ 9.0           |
| QMS               | ○ 8.5           |
| Star Micronics    | ○ 8.4           |
| Tandy             | ○ 9.8           |
| Tektronix         | ○ 8.2           |
| Texas Instruments | ○ 14.3          |
| Xerox             | ▲ 6.6           |

**Our Contributors:** SAMANTHA J. EDWARDS is a project manager in *PC Magazine's* research department. JAMIE M. BSALES was the associate editor in charge of this story.

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Trying to get your head around

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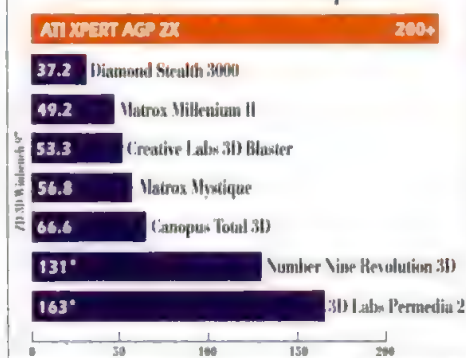
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## AGP 3D Performance Comparison



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tion of average and below-average scores. (No printer vendor in our survey receives below-average scores on every measure.) This year five vendors receive a grade of D: Brother, Citizen America, QMS, Tandy, and Texas Instruments.

Brother's individual scores remain the same as in our previous survey—average on all measures except satisfaction with repair experience, where readers rate the company worse than average. QMS has also received a D both last year and this year, but its individual scores for overall reliability and satisfaction with repair experience have improved to average; the only score keeping QMS in the D range is the incidence of units needing repair in the past 12 months.

Citizen America earned a C last year but falls to a D this time around. Its score for satisfaction with overall reliability has dropped from average to worse than average. The remaining two vendors, Tandy and Texas Instruments, are no longer in the business of selling printers under their brand names.

#### REPAIR EXPERIENCES

Of those respondents who have had at least one repair experience in the past 12 months, only 16 percent report that the

problem was resolved over the phone, and 79 percent report that repair service was necessary. 64 percent contacted personnel other than the manufacturer's to have their printers repaired, with most of them (34 percent) calling on third-party service providers.

Our readers report that the average time they have spent on hold to reach live technical support was 10 minutes. Only two vendors—HP (8.3 minutes) and Xerox (6.6 minutes)—fare better than this average statistically, and Canon customers report waiting on hold longer than the average (13.9 minutes).

When a customer does get through, is the level of help satisfactory? Our readers indicate that there's room for improvement. For example, of the respondents who have had at least one technical-support experience, 47 percent report that the persons who spoke with them were knowledgeable, 41 percent say that the problems were resolved promptly, and 35 percent report that the contacts did everything possible to help them. Still, although 21 percent of our readers report that they had to call more than once to get the technical support they needed, only 12 percent felt that they got a runaround or were trans-

ferred excessively. Half of our respondents say they spent 5 minutes or less on the phone.

#### BUY IT AGAIN, SAM?

It's one thing to be satisfied (or dissatisfied) with various aspects of a printer. The real question is: Knowing what you know, would you buy from the same vendor again? Almost 80 percent of those who have used Hewlett-Packard printers in the past two years rate the likelihood of their purchasing a new HP product as extremely likely. For Epson, the other vendor that receives a grade of A, readers are also more likely than average to put down money again for an Epson product. Canon, Lexmark, Okidata, and Tektronix customers are also more likely than average to come back. And despite Brother's grade of D, users report that they are more likely than average to purchase a Brother product in the future.

Who should be worried? On our survey, readers report that they are less likely than average to buy again from Citizen, Digital, QMS, and Star Micronics. We'll see whether these vendors improve their fortunes in future surveys or whether our readers' responses portend problems to come. **PC**

## How We Surveyed

In February 1997 we mailed 17,000 questionnaires to a randomly selected sample of *PC Magazine* subscribers. The survey was closed for tabulation on April 14, at which time we had achieved a 50 percent response rate. Willard & Shullman, a research firm based in Greenwich, Connecticut, tabulated the survey.

We asked subscribers to rate their satisfaction with up to five printers they had used in the past two years, using a 10-point scale where 10 means "very satisfied" and 1 "not at all satisfied." Respondents rated their satisfaction with overall reliability, repair experience, and technical support.

In the final tabulations we included only those vendors for which we had received at least 50 responses—the minimum amount of data necessary to

produce statistically reliable results.

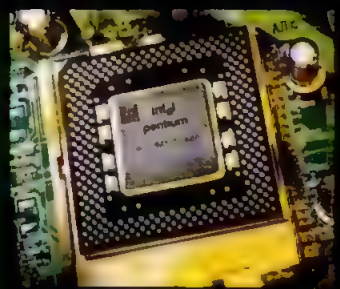
To analyze these results, we focused on each question individually and calculated a score (the mean average of the individual ratings) for each vendor. As a standard of comparison, we calculated an overall average for each measure by adding all the vendors' scores and dividing by the number of vendors rated. Finally, we compared each vendor's scores against the overall averages using a *t-test*, a statistical procedure used to identify statistically significant differences from the average.

T-tests take into consideration such variables as the ratings, the amount of variation among them, and the number of ratings received for each vendor. These components determine the *confidence interval* for each score, or the range into which we are 95 percent

certain that the score falls. The fewer the ratings and the greater the amount of variation among them, the larger the range will be. Only when the range is entirely above or below the overall average is the vendor's score considered significantly different from the average. Thus, two vendors may have identical scores, but because the individual ratings form different ranges, one vendor may be considered average while the other is better than average.

The accompanying chart indicates how each vendor fared relative to the average on the three measures that determine its grade on our Readers' Report Card. We also show how each vendor fares relative to the average on a fifth measure we asked readers about: the likelihood of their buying a printer again from the same vendor.—SJE





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# TAMING THE PAPER TIGER

If your office is turning into a jungle, these document-imaging products can help you find your way through the thicket.

By Ben Z. Gottesman

**A**mong its many touted advantages, the PC was supposed to liberate us from the mountains of paper that accumulate in our offices. But computers are quite good at producing more piles of paper: The Web pages, e-mail messages, and documents we print each day only add to the mess. So the promise of the paperless office seems to have turned out to be more of a pipe dream.

Don't despair. Your PC, a prime culprit in this pesky paper problem, can also be your savior, helping you take control of those piles of pulp.

The solution is *personal document-imaging software*. This mouthful of a product category encompasses a group of programs designed to help you store all this paper inside your computer.

Large organizations such as banks, insurance com-



panies, and government agencies long ago recognized the benefits of document imaging—scanning documents so that their images could be easily shared throughout the organization and efficiently archived. The software required very fast scanners and computers and huge amounts of storage to manage the reams of incoming paper.

About three years ago, Visioneer showed users how their PCs could provide them with benefits similar to those that the large corporations enjoyed. The company's PaperMax scanner and MaxMate software struck a nerve. The PaperMax was a small, torpedo-shaped, black-and-white scanner that could sit on top of your computer waiting to be pressed into service.

When you placed a piece of paper at the lip of the scanner, it woke up and scanned the page right into the MaxMate software. With the program, users could quickly view thumbnail versions of the documents or the full images. MaxMate also provided very good integration with applications. The user could drag a document to a word processor's icon, and the image of the document was converted to text through OCR software and placed in the word processor. It was an affordable, quick, easy, and reasonably powerful solution.

Since then, several vendors have jumped on the bandwagon. Most designed their products explicitly for the individual user, while some, such as CompuLink Management Center, brought the capabilities of their higher-end, network products to the individual.

Essentially, these programs are digital photocopiers; they create images of documents. The contents of the documents cannot be altered. However, most of the programs provide a variety of annotation tools such as sticky notes, arrows, highlighters, rectangles, and ellipses. For this

story, we tested document-imaging products ranging in price from TDF Corp.'s free Personal Image Edition to CompuLink's \$195 LaserFiche Desktop for Windows Personal Edition.

The two keys to document-imaging software are input and retrieval. First, you need to get the documents into your com-

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puter. Typically, this is done through a scanner, and the personal sheet-fed scanners reviewed in this issue's story "SOHO Scanners" make ideal companions to the products reviewed here.

Once you've scanned a document, you need some easy way to find it later. There are a variety of methods for doing this. One is *key-wording*, or entering words that help identify the document. For example, if you received a press release about the upcoming Windows 98, you might append the keywords *Windows*, *Microsoft*, and *operating system*. The next step up in this method uses document *templates* or *profiles*, which provide specific fields such as title, author, date, subject, and so on, for describing a document.

Another important tool for finding documents, included in about half of the programs in this roundup, is *full-text indexing*, where the software runs the document through an optical character recognition (OCR) module and extracts all the words it can recognize. The program then places those words in an index, which can be searched for near-instantaneous results. Search on *Microsoft*, for instance, and you'll find every document in which the company is mentioned. Typically the

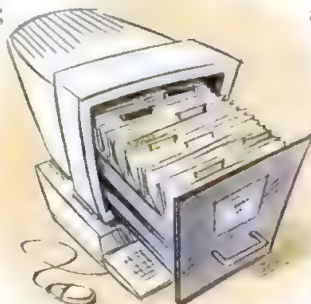
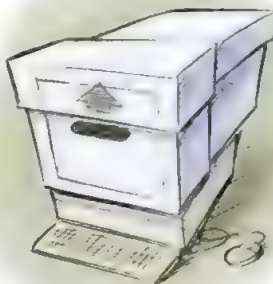
results are ranked in order of relevance, based on the number of hits and their locations in the document. If you are scanning a significant number of documents, we strongly recommend that you choose a package with a full-text indexing.

Most of the programs in this roundup also provide some sort of folder system, similar to Windows Explorer's file-folder metaphor. All documents of a particular type can be stored in an appropriate folder, such as invoices, press releases, articles, and so forth. Programs usually provide one or more methods for image retrieval, though few offer every method.

The role of OCR in document imaging can be confusing. OCR can be used for two purposes. The first is full-text indexing, discussed above. The second is converting a document image to text for importing to a word processor, e-mail message, or the like. Both uses are desirable, but bear in mind that while you can always add a separate OCR package to your software arsenal, you can't add full-text indexing if it isn't built into your program.

Several key players in this category also were in our roundup two years ago, but there are some interesting new additions as well. Personal Image Edition, for example, is an enticing free stand-alone package, but watch your step if you want to share the application, because the price for the network version jumps to the thousands. Imaging for Windows Professional Edition, formerly owned by Wang and now owned by Eastman Software (a division of Kodak), is a much more powerful version of the Imaging for Windows product included with Microsoft Windows 95. Also new to the category is CompuThink's The Paperless Office.

However, the most revolutionary product in this year's roundup is ScanSoft's Pagis Pro 97. (ScanSoft is the new name for the Xerox division responsible for Pagis Pro and the popular OCR program TextBridge.) Pagis Pro is different for several reasons. First, rather than stor-



**Our Contributors:** BEN Z. GOTTESMAN is a technical director at PC Magazine Labs. DAVID HASKIN and DAVID A. HARVEY are frequent contributors. DIANE JECKER was the project leader, and JOHN MORRIS was the associate editor in charge of this story.



ing documents in its own repository, Pagis simply uses the Windows filing system. Matched with Verity's search engine, the program can find any document type anywhere on your computer. This is an interesting approach, but we generally prefer a separate area for storage.

More important, Pagis has come up with an extremely effective method for storing color images. Inexpensive color scanners are everywhere now, but scanned images of color documents are huge. A 24-bit color scan can take up more than 10MB. Even with standard compression schemes, the files are so big that they can quickly fill up your hard disk and slow down your system.

ScanSoft's solution is the proprietary .XIF image format, an extension of the TIFF format. Pagis Pro analyzes the document and divides it into text and image zones. Text zones are stored as one-bit (black and white), while areas with color images are saved with full fidelity. This format can reduce a typical business document to about 350K. If you want to store most of your scans in color, Pagis Pro is the only practical solution available today.

Also new this year is Visioneer's PaperPort Deluxe, an enhanced version of the PaperPort software packaged with Visioneer's scanners. Deluxe adds full-text indexing, long requested by PaperPort users, as well as ScanDirect, the ability to scan right to your printer, your fax modem, or an application, without launching the PaperPort interface. Several other vendors in this roundup have added similar features to their products this year.

Another key to these products is integration with other applications. PaperPort Deluxe integrates with more than 185 popular applications through proprietary link modules. Most of the other programs rely on more generic links.

The flip side of sending documents from the document-imaging software to your other applications is the ability to manage electronic documents created by other applications within the imaging software. Pagis Pro stands out here, while other programs are more limited.

Of course, these programs also have Internet features. For example,

## Editors' Choice

### • PaperPort Deluxe 5.1



*Visioneer pioneered the personal document-imaging concept about three years ago with its MaxMate software/scanner bundle.*

Although the promise of the paperless office remains elusive, the category has evolved considerably since then. Keeping pace with these changes, Visioneer introduced PaperPort Deluxe 5.1 just in time for testing. And it was worth the wait.

PaperPort Deluxe is at once easy to use and powerful. The program uses a proprietary database for storing documents, and it has its own interface, but it integrates nicely with an existing scanner interface. When you launch PaperPort, it automatically scans your hard disk and creates links to any of 185 programs that it finds there. You can drag and drop images onto application icons to perform OCR, if appropriate, and then insert the resulting file into an application.

For even faster results, a ScanDirect feature lets you scan and optically read documents directly into an application such as Microsoft Word in a single step. And if you also have a Visioneer scanner, such as the PaperPort Strobe (re-

viewed in this issue's story "SOHO Scanners"), you can scan a document, perform OCR, and dump the text into the desired application without ever touching the mouse or keyboard.

PaperPort can automatically scan documents for indexing, as well as perform OCR. And you can configure PaperPort to reindex documents in its database whenever your PC is idle. The program's relatively powerful search capabilities include fuzzy, wildcard, and Boolean searches.

One product, newcomer Pagis Pro 97 from ScanSoft, deserves honorable mention for innovations that will likely influence the rest of this market. Rather than providing its own database, Pagis Pro uses Windows' native filing system and Windows Explorer for document management. Pagis Pro is the only product we reviewed that allows you to index the entire contents of your hard disk.

Perhaps even more significant is Pagis Pro's proprietary .XIF file format, an extension to TIFF. The .XIF format allows Pagis Pro to store text and color regions of a document at different bit depths. This approach significantly reduces the amount of disk space required for storing color images.

A first-version product, Pagis Pro 97 still has some rough edges, and its assortment of tools can be more difficult to use than a single, integrated program such as PaperPort Deluxe. Nevertheless, based on its innovations, we expect Pagis Pro to be a player in this category.

DocuMagix's PaperMaster Live and NewSoft's Presto! PageManager let you store Web pages along with other document types. We found these implementations clumsy, however, and we still recommend using a dedicated off-line browser.

There are as many document-imaging options out there as there are piles of paper covering your desk. But as we discovered,

only a handful of products provide a comprehensive, integrated set of scanning, editing, and searching tools. So if you're ready to dig yourself out, this story will help you find the right shovel for the job.



Eastman Software Inc.

### Imaging for Windows Professional

With some automation features not found in other products in this category, and extensive scanning options, Imaging for Windows Professional 1.1 (\$95 street, \$79 download) is an impressive document-imaging tool. It's less impressive as a document management tool, however, because it lacks full-text indexing. Despite this significant omission, Imaging Professional is a good choice for imaging tasks, and it is tightly integrated with Microsoft Windows.

Imaging Professional supports Twain and Visioneer scanners. You begin the



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## Document Imaging

scanning process by clicking on a toolbar button in the Image Editor. Imaging Professional saves the document in a compressed TIFF format in the Windows folder you select. Like ScanSoft's Pagis Pro 97, Imaging Professional doesn't have a separate database for storing documents

plex flow could perform OCR after the scan and, if the OCR process finds a specific word, e-mail that document to a particular person in your Microsoft Exchange client address book.

You create flows either by using a wizard or by clicking on toolbar buttons in the flow-editing applet to add a step in the flow process. Either method is simple enough for non-technical users.

While Imaging Professional does not support full-text indexing, it does supply predefined fields for information such as keywords and the author's name, which you can use to find documents later. Flows can enter data in those fields automatically.

Imaging Professional integrates well with other applications. The Image Editor has toolbar buttons that launch the OCR process on scanned documents and drop the text into Microsoft Excel or Microsoft Word, or into your Web browser as an HTML page. You also can place icons in Microsoft Excel and Word that launch the

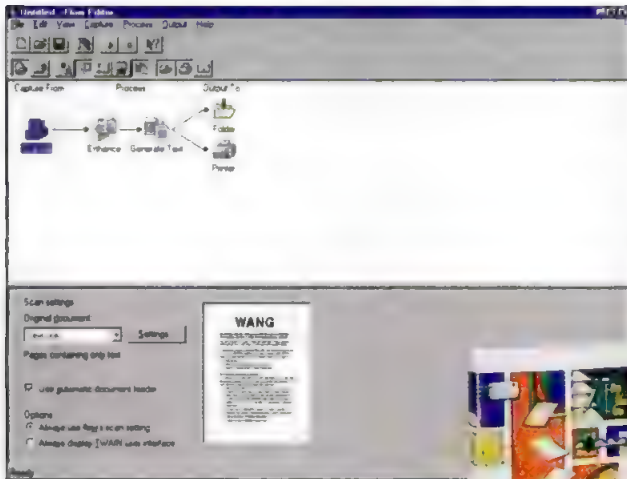
scanning process and insert the document in those applications. In other OLE-compliant programs, you can initiate a scan using the given application's Insert Object menu. In either case, double-clicking on the embedded image enables you to edit the document in place.

The program also builds itself into Windows Explorer. Right-clicking on a scanned document, for example, enables you to launch flows and other tasks such as converting between file formats. The product also uses a full version of Xerox's OCR product TextBridge. On informal tests, TextBridge successfully performed OCR on skewed or photocopied documents in addition to faxes.

Imaging for Windows Professional is not a full-featured document manager, and it won't help you find the needle in your hard disk's haystack. But it is an excellent imaging solution, and if you plan to scan a lot of images, its automation features make it an attractive solution.—

David Haskin

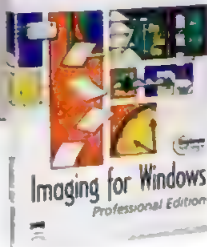
**Imaging for Windows Professional 1.1.** Street price: \$95; download, \$79. Requires: 486-based PC or better, 8MB RAM, 30MB hard disk space, Microsoft Windows 95 or Windows NT 4.0. Eastman Software Inc., Billerica, MA; 800-533-0838, 508-747-5969; fax, 508-747-2139; [www.eastman-software.com/imaging](http://www.eastman-software.com/imaging). Circle 442 on reader service card.



Imaging Professional can create "flows" to automate document imaging.

or a separate interface for accessing them.

A unique feature of Imaging Professional lets you automate scanning, image processing, and output with *flows*, or highly customizable macros. You can create a flow, for example, that automatically scans a document, saves it to a specific folder, and gives it a specified name. A more com-



## SUITABILITY TO TASK: DOCUMENT IMAGING

|                         |  |  |  |  |  |  |  |  |
|-------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| POWER                   | Imaging for Windows Professional                                                    | LaserFiche Desktop for Windows                                                      | Pagis Pro 97                                                                        | The Paperless Office                                                                | PaperMaster Live                                                                    | PaperPort Deluxe                                                                     | Personal Image Edition                                                                | Prestel PageManager                                                                   |
| Input and storage       | Excellent                                                                           | Good                                                                                | Good                                                                                | Excellent                                                                           | Fair                                                                                | Good                                                                                 | Fair                                                                                  | Fair                                                                                  |
| Search and retrieval    | Fair                                                                                | Excellent                                                                           | Good                                                                                | Fair                                                                                | Fair                                                                                | Excellent                                                                            | Poor                                                                                  | Good                                                                                  |
| Application integration | Good                                                                                | Poor                                                                                | Good                                                                                | Excellent                                                                           | Good                                                                                | Good                                                                                 | Fair                                                                                  | Fair                                                                                  |
| EASE OF USE             |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                      |                                                                                       |                                                                                       |
| Input and storage       | Good                                                                                | Excellent                                                                           | Excellent                                                                           | Fair                                                                                | Fair                                                                                | Excellent                                                                            | Fair                                                                                  | Good                                                                                  |
| Search and retrieval    | Fair                                                                                | Excellent                                                                           | Excellent                                                                           | Poor                                                                                | Fair                                                                                | Good                                                                                 | Fair                                                                                  | Good                                                                                  |
| Application integration | Good                                                                                | Poor                                                                                | Good                                                                                | Good                                                                                | Fair                                                                                | Excellent                                                                            | Fair                                                                                  | Good                                                                                  |

We rate document imaging software for power and ease in three categories.

**Input and storage** focuses on how the user gets the documents and images into the software and what occurs when they get there. We examine document storage capabilities of each product, including the storage metaphor used, data management by archiving, and thumbnail views, as well as automatic filing of scanned documents, faxes, and other electronic files.

For **search and retrieval** we look at the robustness of each product's search engine and the types of searches offered (keyword, full-text, Boolean, fuzzy), and the value of the search results.

We judge **application integration** by how well the product imports and exports files to other applications including Twain scanner drivers and fax and printer software, as well as its ability to drag and drop files onto application icons.



**Bells, whistles and a little something  
to silence the competition.**

### SATISFACTION HP IS UNSURPASSED IN OVERALL SATISFACTION

Given that HP ranked at the top in both vendor reputation and service and support, it'd come as no surprise that HP excelled in overall satisfaction in the notebook market. Based on a scale of 1 to 5, where 1 is "not satisfied" and 5 is "completely satisfied," HP garnered the top score of 4.27 from 1,651 managers who purchase desktop systems.

### 1997 NOTEBOOK SURVEY RESULTS

|         | SERVICE AND SUPPORT | REPUTATION |
|---------|---------------------|------------|
| HP      | 3.96                | 4.27       |
| DELL    | 3.81                | 4.10       |
| IBM     | 3.65                | 4.00       |
| TOSHIBA | 3.48                | 3.94       |

### HP achieves highest rank among notebook vendors

|                   | HP   | DELL | IBM  | TOSHIBA |
|-------------------|------|------|------|---------|
| VENDOR REPUTATION | 4.27 | 4.10 | 4.00 | 3.94    |

Support grades show that users don't necessarily sacrifice service by choosing direct sales. HP's grade of 3.96 is the highest among all vendors, while Dell's grade of 3.81 is the lowest.

You've decided what you want in a notebook. But before you decide which one to get, consider that in a recent customer survey by *Computerworld*,

**HP OmniBook 5700**  
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HP was ranked at the top in overall satisfaction

among 1,651 IT buyers of notebook computers. Perhaps that's because



**HP OmniBook 800**  
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performance.*

HP's entire family of OmniBooks was unsurpassed in the survey when it came to service and support, vendor comfort and reputation. Couple that with

the fact that HP scored significantly above average in every other category in the survey, and a certain

something begins to ring true. From the value-priced

OmniBook 2000, to the lightweight 800 model,



HP is being recognized as a leader

in notebook computing across

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## CompuLink Management Center

**LaserFiche Desktop for Windows**

Getting back to the basics, CompuLink Management Center focuses on the fundamentals of document imaging with its LaserFiche Desktop for Windows 4.1. The 32-bit standalone client uses its own database structure and keyword indexing, two hallmarks of this market. Yet LaserFiche is also one of the more sophisticated—and more expensive—packages in this category (\$200 street). In addition, it's one of the few standalone document-imaging packages with an upgrade path to a network version (\$3,340 street).

LaserFiche Desktop supports full-text indexing, but the key to its power is another indexing method, similar to index cards, which profiles key characteristics of documents for maximum control. You can use LaserFiche Desktop's default templates or create your own. The index cards contain date, number, and character fields, and you can create drop-down lists of values. You also can edit profiles after a document is in the system or attach a different profile to a document.

For those who need to scan a lot of documents, LaserFiche Desktop excels at managing batches of paper. Whether you're starting with text or images, simply pull your information into LaserFiche Desktop and open the batch-processing screen. As we worked through our 50-page test batch, we were able to adjust contrast and brightness, rotate the pages, and perform other imaging functions before the final processing.

Some irritating quirks mar an otherwise impressive package. For example, although it is a 32-bit application, LaserFiche Desktop doesn't support long filenames during importing or when you save files. And it no longer supports 16-bit Twain scanners—a significant drawback in this market.

Finally, many advanced features require separate plug-ins. To send documents via e-mail or to print from applications to LaserFiche Desktop's file system, for example, requires plug-ins. And while you can fax from LaserFiche Desktop, you can't directly import faxes, and the program is not integrated with other fax software. Worse, LaserFiche Desktop failed to import our multipage TIFF files, bringing in only the first page of each.

The differences between imaging software and document management software are not always clear, and many packages offer elements of each. The core function of imaging software is to get paper-based information into an electronic format so it can be stored safely and accessed easily. Document management software is designed to manage documents that are already in electronic format, such as word processing and spreadsheet files. The higher-end products of both types often provide workflow features. Document management software also includes versioning. Both categories include products for a range of audiences, from standalone users to the enterprise. More recently, imaging and document management have migrated to the Web.

**Imaging software**

These products, the main focus of our story, perform basic imaging and document management functions for individual users. They enable you to scan documents, manage the images, and convert the images to text using OCR. You can search for documents by keywords or, if your product supports full-text indexing, by document contents. Examples include ScanSoft's *Pagis Pro 97* and *Visioneer's PaperPort Deluxe 5.1*.

This category includes both scaled-up versions of the standalone products and, more typically, scaled-down versions of enterprise-level products. These products allow teams to maintain electronic databases of documents related to specific projects. Examples include *FileNet Workgroup*, *Novell's GroupWise Imaging*, *LaserFiche*, *Lotus Notes Document Imaging*, and *Recollect LAN*.

These industrial-strength imaging systems are designed to process large volumes of paper. Workflow automation is common at this level. For example, an insurance company might use imaging software to scan claim forms and route them from receipt to disbursement. Products in this category include *KeyFile*, *Samson InfoTech's Samson Capture*, *FileNet's Watermark Image Server*, and *ViewStar*.

The concept behind this category is simple: to make existing document-image databases accessible via browsers or Java applications on an intranet or extranet. Employees in the field, customers, and independent contractors can access corporate information. Products in this category include *InfoStore@Work*, *Net-It Central*, *Optix Web*, *Process@Work*, *ViewStar*, *Infodata Systems' Virtual File Cabinet*, *Watermark Enterprise Edition*, and *FileNet's WebSeries*.

**Document management software**

These utilities let you quickly locate documents on your hard disk created with a standard end-user application such as a word processor. Examples include *AltaVista Search Personal eXtension 97*, *Microsoft Find Fast*, *Corel's QuickFinder*, and *Verity's Search '97 Personal*.

Like their enterprise-level counterparts, **workgroup document managers typically insert themselves between users and their productivity applications** by replacing the File Open and File Save dialog boxes. They enable search and retrieval of documents, document check-in and check-out functions, and audit trails. A typical example is the Document Library feature in *Novell's GroupWise*.

In addition to document check-in and check-out features, these LAN- and WAN-based client-server packages include **robust workflow components for tasks like routing documents through an approval process**. Products in this category include *Documentum*, *NovaManage*, *PC DOCS Open*, and *Saros Document Manager*.

This category is still under development. The challenge is to allow users not only to access live documents securely via a Web browser but also to work on these documents and to track changes. Pioneering products include *PC DOCS' CyberDocs*, *Documentum RightSite*, *Xerox's DocuShare*, *FrontOffice Technologies' FrontOffice for Microsoft Exchange*, *iManage Internet*, *Lotus Domino Doc*, *NovaWeb*, and *Open Text Livelink Intranet*.

When it comes to searching for files, though, LaserFiche Desktop is the Sherlock Holmes of document imaging. You can search for documents by their index fields or by contents, with a full range of Boolean operators and fuzzy logic at your disposal. For more complex jobs, you can build a search expression or even a set of expressions.

LaserFiche Desktop is not a complete solution, but it is one of the most power-

ful programs in this category. And with intelligent indexing and robust search capabilities, it excels at managing large quantities of documents. If you need complete control over your documents, you should consider LaserFiche Desktop.—David A. Harvey

**LaserFiche Desktop for Windows 4.1.** Street price: \$200. Requires: 486-based PC or better, 16MB RAM, 20MB hard disk space, Microsoft Windows 3.1 or later,



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## DOCUMENT IMAGING

Internet-based document-imaging systems allow users to search for and view images of corporate documents with a Web browser.

**Adobe Acrobat Capture 2.0.** List price: Up to 20,000 .PDF conversions, \$895. Adobe Systems Inc.; 800-833-6687; [www.adobe.com](http://www.adobe.com).

**FileNet WebSeries.** List price: Connector, \$25,000. FileNet Corp.; 800-345-3638; [www.filenet.com](http://www.filenet.com).

**Net-It Central.** List price: \$4,995. Net-It Software; 888-638-4866; [www.net-it.com](http://www.net-it.com).

**Optix Web.** List price: \$80,000. Blueridge Technologies; 540-675-3015; [www.optix.com](http://www.optix.com).

## DOCUMENT MANAGEMENT SYSTEMS (DMSs)

These products support document-management functions such as check-in and check-out from a Web browser.

**CyberDocs.** List price: \$20,000 per server, Docs Open required. PC DOCS; 800-933-3627; [www.pcdocs.com](http://www.pcdocs.com).

**Documentum RightSite.** List price: Minimum 50 users, \$75,000. Documentum; 888-362-3367; [www.documentum.com](http://www.documentum.com).

**iManage Internet.** List price: \$20,000 per server, \$199 per client. NetRight Technologies; 312-977-0664; [www.netright.com](http://www.netright.com).

**Livelink Intranet.** List price: Basic intranet server, \$62,500. Open Text; 519-888-7111; [www.opentext.com](http://www.opentext.com).

**Virtual File Cabinet.** List price: \$15,000. Infodata Systems; 800-336-4639; [www.infodata.com](http://www.infodata.com).

## MESSAGING-BASED SYSTEMS

These systems piggyback in existing messaging groupware environments.

**Domino.Doc.** List price: \$4,257. Lotus Development Corp.; 800-575-6887; [www.lotus.com](http://www.lotus.com).

**FrontOffice for Microsoft Exchange.** List price: \$125 per user, minimum 1,000 users. FrontOffice Technologies; 650-570-6000; [www.frontofficetech.com](http://www.frontofficetech.com).

## ACCESS DOCUMENTS FROM THE WEB

A year ago, most vendors still were unsure how to exploit intranets as a platform for viable business solutions. Now everyone is getting on the Web bandwagon, including vendors of document-imaging and document management systems (DMSs). And they are making inroads with corporate America.

One of the goals behind Internet-based document-imaging and document management systems is making documents accessible from a Web browser. Document-imaging systems in the Net-based category are designed to handle large volumes of scanned images. They allow users to search for and access document images from a browser. Document management systems go a step further, adding document check-in and check-out and workflow features. In both categories, the shift to the Web can translate into big advantages.

A key benefit of Internet-based document management is reduced administrative overhead. Employees can make information available to an entire enterprise quickly without a Webmaster's help. More sophisticated document-imaging systems can automatically convert documents to HTML and post them to a Web server, further reducing administration and making information immediately available.

Perhaps the biggest benefit of Internet-based document imaging and managing is increased accessibility. Documents and images stored in Internet-

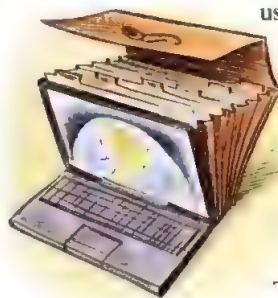
based systems can be searched, viewed, and even edited by anyone with an Internet connection, a Web browser, and the appropriate security rights. This is especially beneficial to companies that have employees in the field and to organizations that want to make databases accessible to customers.

While most Web-based DMSs use traditional database backends from vendors such as Informix, Oracle, and Sybase, some developers are tying document management to messaging systems such as Lotus Notes and Microsoft Exchange.

These systems currently lack the power of other Web-based imaging and document management systems, but they are relatively simple to set up and cost less than traditional, SQL-based DMSs.

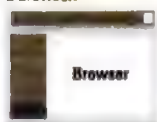
The Internet holds a lot of promise for imaging and document management, but even vendors acknowledge that some problems remain. The most obvious is HTML's lack of support for such conventions as drag-and-drop. Another disadvantage is poor integration with existing applications. Finally, security remains an issue. Vendors are making progress in all three areas.

The switch from LAN- and WAN-based document imaging and management systems to Internet-based systems will change more than just how enterprises handle documents. It will change the way organizations work, making information more distributed, accessible, and ubiquitous.—DH



## BROWSING THE COMPANY STORE

Internet-based document management systems allow users to access and edit documents from a browser.



Most work with your existing Web server software.

Web server



When the user clicks on a certain URL, the Web server transfers the message to the document management application.

Document management application



RDBMS



...which formulates a query requesting the document from a relational database management system.

The RDBMS ensures that the user has the appropriate permissions and then delivers the document.



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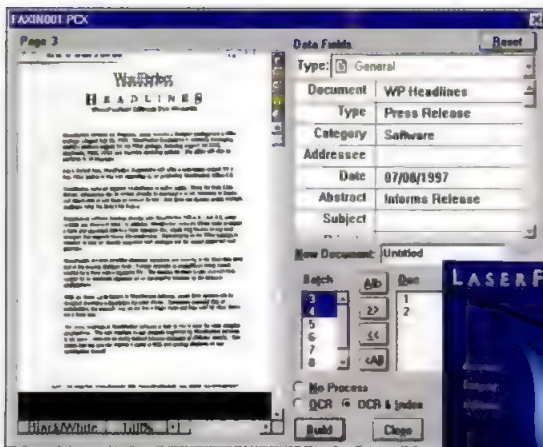
[www.hpresource.com/racks](http://www.hpresource.com/racks)

\*Based on TPC-C™ benchmark results of 10,505 tpmC at \$48.72 per tpmC released August 18, 1997. The Intel Inside logo and Pentium are registered trademarks of Intel Corporation. ©1997 Hewlett Packard Company



## SOFTWARE

### Document Imaging



When you batch scan, LaserFiche lets you sort, group, and index documents in any order.



Windows for Workgroups 3.11, or Windows NT 4.0. CompuLink Management Center, LaserFiche Document Imaging Division, Torrance, CA; 800-725-9955, 310-212-5465; fax, 310-793-8531; [www.laserfiche.com](http://www.laserfiche.com). **Circle 443 on reader service card.**

#### ScanSoft Inc.

### Pagis Pro 97

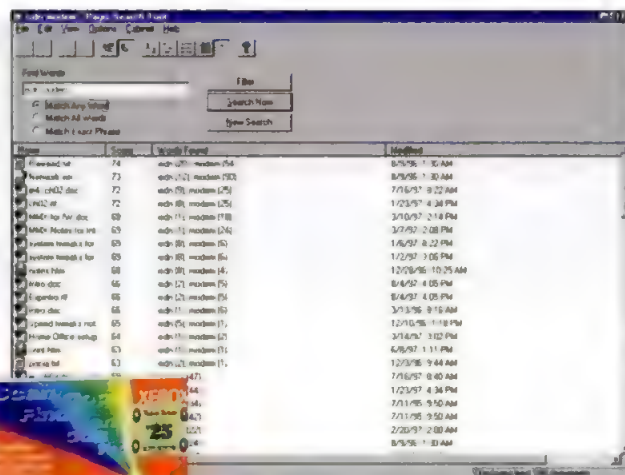
An easy-to-use document-imaging program, Pagis Pro 97 (\$100 street) has a broad set of features. And in place of a proprietary interface for managing documents, it offers a set of utilities integrated with Microsoft Windows and productivity applications. But Pagis Pro's real asset is a unique, efficient file format that saves disk space when the program is scanning and storing color documents.

The most useful utility in Pagis Pro's toolbox is Scan Tool, which has tabs for scanning and storing documents, faxing scanned items using your fax software and modem, and "photocopying" (printing) documents. During scanning, you select the destination. Since Pagis Pro does not have its own interface, you use Explorer to manage saved documents.

When you right-click on a scanned document's icon, you can view a thumbnail or convert it from Pagis Pro's default, proprietary .XIF format to .BMP, .DCX, JPEG, .PCX, or one of four flavors of TIFF. The .XIF format significantly reduces file size by allowing you to store text and images at different bit depths in a single file. In one instance, a document that consumed 20MB in another popular document-imaging product required only 300K when scanned using the .XIF format. For this reason, if you plan to scan a large quantity of color documents, Pagis Pro is the only viable choice in this category.

Besides automatically indexing pages

Scan Tool serves as a substitute interface for ISIS and Twain scanner drivers. Scan Tool is simpler to use than many scanner drivers, but some of your scanner's capabilities may not be available. Scan Tool's highest resolution is 200 dpi, for example, and it supports only two color depths: gray-scale and millions of colors. However, you can set separate depths for pictures and text, and you can scan as many pages as you want into a single file.



Pagis Pro indexes all files on your hard disk, giving you control over all files, not just images.

after scanning, the Pagis Search utility can index your entire hard disk. Pagis Search looks and works like Windows 95's Find utility. Search results are ranked by relevance. Pagis Search supports Boolean,

keyword, and author searches, but not fuzzy logic and wildcards. Moreover, though you can exclude drives and folders from indexing, you can't easily include or exclude by file type.

Moving scanned documents to other applications is simple. Pagis Pro's Send-To Bar is a toolbar with icons for all the applications in your Windows 95 SendTo folder. Dragging an image to an icon loads the image in that program; dragging a text document starts the OCR process and places editable text in the program you selected. Pagis Pro uses a full version of ScanSoft's OCR product, TextBridge Pro 96, and its image editor lets you annotate documents, change their color depth, and remove dots, extraneous lines, and shading.

We found a lot to like in Pagis Pro. It works seamlessly with existing applications and provides a powerful set of document-imaging tools. In short, Pagis Pro 97 is one of the easiest ways to scan, manage, search for, and annotate your documents.—DH

**Pagis Pro 97 1.1.** Street price: \$100. Requires: 486-based PC or better, 16MB RAM, 25MB hard disk space, Microsoft Windows 95 or Windows NT 4.0. ScanSoft Inc., a division of Xerox Corp., Peabody, MA; 888-997-2447, 978-977-2000; fax, 978-977-2425; [www.pagis.com](http://www.pagis.com). **Circle 444 on reader service card.**

#### CompuLink Inc.

### The Paperless Office

A straightforward, multiuser document and image management program, The Paperless Office (\$70 street) combines a powerful set of image manipulation tools with a robust storage system. But it also has its limitations: The program does not support full-text indexing, and it can import only image files.

Once The Paperless Office is up and running, it works via a set of modules, called *desks*, which you can access only by clicking on buttons in a window that appears when you launch the program. You can set up accounts to control precisely what any user does in the program. For example, a user can be an administrator, a scan operator, or someone who just has permission to print. You can also create permission lists for individual folders. The Paperless Office also



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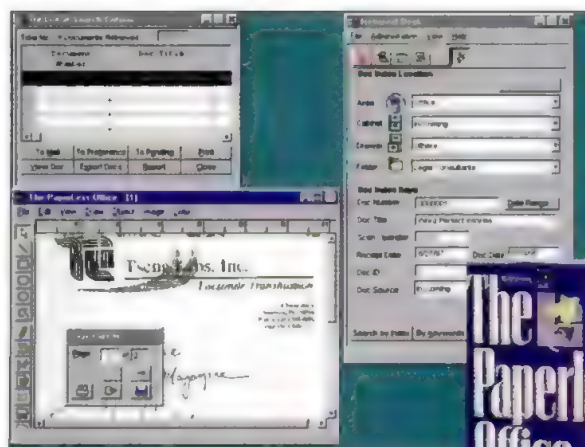
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## Document Imaging



In *The Paperless Office*, a hit-list table lets you quickly navigate through the results of a search.

comes in a network version that supports up to 100 users.

The *Paperless Office*'s queues set the package apart from the other products in this roundup. Designed to facilitate workflow both for individual users and for groups, queues "hold onto" documents until the appropriate user acts on each of them. The program stores documents in a hierarchical-folder manner, and you can display the contents of any level via a query.

The *Paperless Office* comes with Centura Software Corp.'s 32-bit SQL database, which can store more than 100,000 documents. You import or scan documents into the Capture Desk and send those files to the Index Queue. The Index/Quality Control Desk allows you to retrieve documents from the Index Queue and create folder assignments, field names, keywords, and free-text document notes. You can also select an area with the OCR tool and drag it to a field; The *Paperless Office* will insert up to 40 characters into an index field and 256 characters into a keyword field.

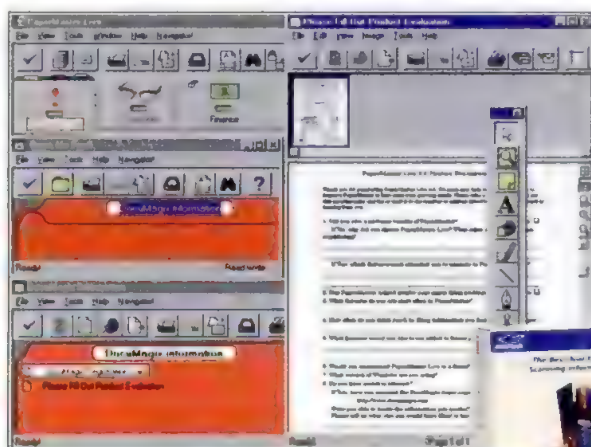
Note that when you're pulling in an image file or scanning, you have to do so one page at a time. (The network version has automatic document-feeder support.) What gives this scheme some power is the Rework Queue, located in the Document Index/Quality Control Desk screen, which lets you add pages to documents, rescan pages, or make other changes. Mutually exclusive searches (by folder, index values, or keywords) generate three-column tables that list the doc-

ument titles, numbers, and locations.

The image viewer appears when you scan or import, when you retrieve, and when you index documents. This powerful tool lets you draw lines and shapes; add text, OLE objects, and highlighted areas; move and copy portions of images; and adjust almost any image parameter, including brightness, contrast, and dithering. The *Paperless*

*Office* uses Recognita's engine for OCR tasks. (Recognita is a wholly owned subsidiary of Caere Corp.)

Like *LaserFiche Desktop* for Windows, *The Paperless Office* is a solid program for those who deal with a lot of images. It can handle a multitude of file formats, and it offers some unusual security and routing features that make it an attractive solution for workgroups or entire offices. Only the lack of full-text indexing and a more intuitive interface prevent it from being a perfect solution.—DAH



*PaperMaster's* interface is cluttered. To get to a document, you have to open several windows.

**The Paperless Office.** Street price: \$70. Requires: 16MB RAM, 30MB hard disk space, Microsoft Windows 95 or Windows NT 4.0. Computhink Inc., Lombard, IL; 800-988-4465, 630-705-9050; fax, 630-705-9065; [www.computhink.com](http://www.computhink.com). **Circle 445** on reader service card.

*DocuMagix Inc.*

**PaperMaster Live**

To make software easier to use, programmers often borrow ideas from the real world. Graphical operating systems such as Microsoft Windows and the Mac OS are obvious examples. *DocuMagix's PaperMaster Live 3.0* (\$100 street) takes this concept to the extreme: The entire program is centered around a virtual filing cabinet. Although the concept is certainly promising, the end result is less impressive.

The interface quickly becomes cluttered, and many operations are less than intuitive. However, the 32-bit *PaperMaster* is an option if you do a lot of research online, because the program gives you a single place to keep copies of Web pages as well as scanned documents.

Each cabinet, drawer, folder, and document in *PaperMaster* is a window unto itself. And therein lies the program's problem. This is not a Multiple Document Interface-compliant program; for example, you can't tile or cascade the various windows neatly across your screen (although you can use the standard F6 key to switch between windows). You can close all drawers, folders, or documents from the main cabin-

et, but if you open more than a few files, your cursor quickly becomes lost amid a sea of disconnected windows.

Like many of the applications reviewed in this roundup, *PaperMaster* is an image-only application, and it is not adept at handling electronic documents. Like *Personal Image Edition* and *Presto! PageManager*, *PaperMaster* relies on a printer driver to rasterize applica-

tion files into its storage system. Only *Pagis Pro 97* and, to a more limited extent, *LaserFiche Desktop* for Windows allow you to edit files in their native storage systems.

Documents scanned, imported, or



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| Compaq    | Professional Workstation 6000 Diamond Multimedia FireGL 4000 | \$318 |
| Sun Ultra | Ultra 1 Creator3D Model 170E w/Creator3D                     | \$446 |
| SGI       | O2 R5000/180MHz SC02                                         | \$533 |
| Digital   | Personal Workstation 266i w/AccelGraphics AccelPro 2500TX    | \$624 |
| SGI       | Octane 1x175MHz R10000 SI w/Tram                             | \$922 |

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## SUMMARY OF FEATURES

See [www.pcmag.com](http://www.pcmag.com) for interactive views

## Document Imaging

■ YES ■ NO □ OPTIONAL

Products listed in alphabetical order

|                                                                       | Imaging for Windows Professional 1.1 | LaserFiche Desktop for Windows 4.1 | Pagis Pro 37   | The Paperless Office | PaperMaster Live 3.0 | PaperPort Deluxe 5.1 | Personal Image Edition 3.0 | Presto! PageManager 3.0 |
|-----------------------------------------------------------------------|--------------------------------------|------------------------------------|----------------|----------------------|----------------------|----------------------|----------------------------|-------------------------|
| Price                                                                 | \$93 (street), \$79 (download)       | \$195 (street)                     | \$100 (street) | \$70 (street)        | \$100 (street)       | \$100 (street)       | Free                       | \$50 (street)           |
| OLE 2.0 server/container                                              | ■ ■                                  | ■ ■                                | ■ ■            | ■ ■                  | ■ ■                  | ■ ■                  | ■ ■                        | ■ ■                     |
| <b>Database</b>                                                       |                                      |                                    |                |                      |                      |                      |                            |                         |
| Performs Boolean searches                                             | ■                                    | ■                                  | ■              | ■                    | ■                    | ■                    | ■                          | ■                       |
| Performs fuzzy searches                                               | ■                                    | ■                                  | ■              | ■                    | ■                    | ■                    | ■                          | ■                       |
| Spell-checker                                                         | ■                                    | ■                                  | ■              | ■                    | ■                    | ■                    | ■                          | ■                       |
| <b>Indexing and Sorting</b>                                           |                                      |                                    |                |                      |                      |                      |                            |                         |
| Indexes by author/category/creation date                              | ■ ■ ■                                | ■ ■ ■                              | ■ ■ ■          | ■ ■ ■                | ■ ■ ■                | ■ ■ ■                | ■ ■ ■                      | ■ ■ ■                   |
| Indexes by keyword/user-defined category                              | ■ ■                                  | ■ ■                                | ■ ■            | ■ ■                  | ■ ■                  | ■ ■                  | ■ ■                        | ■ ■                     |
| Users can create profiles for indexing                                | ■                                    | ■                                  | ■              | ■                    | ■                    | ■                    | ■                          | ■                       |
| Users can create profiles for keywording                              | ■                                    | ■                                  | ■              | ■                    | ■                    | ■                    | ■                          | ■                       |
| Sorts by any field/primary and secondary fields/multiple fields       | ■ ■ ■                                | ■ ■ ■                              | ■ ■ ■          | ■ ■ ■                | ■ ■ ■                | ■ ■ ■                | ■ ■ ■                      | ■ ■ ■                   |
| Indexes multiple documents simultaneously                             | ■                                    | ■                                  | ■              | ■                    | ■                    | ■                    | ■                          | ■                       |
| <b>Document Image Management</b>                                      |                                      |                                    |                |                      |                      |                      |                            |                         |
| Built-in scanning                                                     | ■                                    | ■                                  | ■              | ■                    | ■                    | ■                    | ■                          | ■                       |
| In-place editing                                                      | ■                                    | ■                                  | ■              | ■                    | ■                    | ■                    | ■                          | ■                       |
| Document revision/Version tracking                                    | ■ ■                                  | ■ ■                                | ■ ■            | ■ ■                  | ■ ■                  | ■ ■                  | ■ ■                        | ■ ■                     |
| Supports ISIS/Twain                                                   | ■ ■                                  | ■ ■                                | ■ ■            | ■ ■                  | ■ ■                  | ■ ■                  | ■ ■                        | ■ ■                     |
| Uses standard Windows folders                                         | ■                                    | ■                                  | ■              | ■                    | ■                    | ■                    | ■                          | ■                       |
| Imports .WMF/Microsoft Word/WordPerfect                               | ■ ■ ■                                | ■ ■ ■                              | ■ ■ ■          | ■ ■ ■                | ■ ■ ■                | ■ ■ ■                | ■ ■ ■                      | ■ ■ ■                   |
| Exports Microsoft Word/WordPerfect/ASCII                              | ■ ■ ■                                | ■ ■ ■                              | ■ ■ ■          | ■ ■ ■                | ■ ■ ■                | ■ ■ ■                | ■ ■ ■                      | ■ ■ ■                   |
| Exports .RTF/tab-delimited                                            | ■ ■ ■                                | ■ ■ ■                              | ■ ■ ■          | ■ ■ ■                | ■ ■ ■                | ■ ■ ■                | ■ ■ ■                      | ■ ■ ■                   |
| Faxes TIFF/CCITT TIFF/Group 4 TIFF                                    | ■ ■ ■                                | ■ ■ ■                              | ■ ■ ■          | ■ ■ ■                | ■ ■ ■                | ■ ■ ■                | ■ ■ ■                      | ■ ■ ■                   |
| Faxes Winfax native format                                            | ■                                    | ■                                  | ■              | ■                    | ■                    | ■                    | ■                          | ■                       |
| Can serve as printer driver for capturing images from any application | ■                                    | ■                                  | ■              | ■                    | ■                    | ■                    | ■                          | ■                       |
| Compresses images                                                     | ■                                    | ■                                  | ■              | ■                    | ■                    | ■                    | ■                          | ■                       |
| Preserves annotations as file attachments                             | ■                                    | ■                                  | ■              | ■                    | ■                    | ■                    | ■                          | ■                       |
| User-defined database password                                        | ■                                    | ■                                  | ■              | ■                    | ■                    | ■                    | ■                          | ■                       |
| Encrypts documents                                                    | ■                                    | ■                                  | ■              | ■                    | ■                    | ■                    | ■                          | ■                       |
| <b>Image-View Options</b>                                             |                                      |                                    |                |                      |                      |                      |                            |                         |
| User can view original document                                       | ■                                    | ■                                  | ■              | ■                    | ■                    | ■                    | ■                          | ■                       |
| Displays thumbnails of documents                                      | ■                                    | ■                                  | ■              | ■                    | ■                    | ■                    | ■                          | ■                       |
| Zoom range                                                            | 2%–6,500%                            | 25%–>100%                          | 1%–800%        | Not defined*         | 1%–200%              | 25%–400%             | 1%–800%                    | 1%–800%                 |
| Can perform OCR automatically                                         | ■                                    | ■                                  | ■              | ■                    | ■                    | ■                    | ■                          | ■                       |
| OCR for indexing                                                      | ■                                    | ■                                  | ■              | ■                    | ■                    | ■                    | ■                          | ■                       |
| Batch OCR processing                                                  | ■                                    | ■                                  | ■              | ■                    | ■                    | ■                    | ■                          | ■                       |
| Preserves graphics during OCR                                         | ■                                    | ■                                  | ■              | ■                    | ■                    | ■                    | ■                          | ■                       |
| Stores graphics separately                                            | ■                                    | ■                                  | ■              | ■                    | ■                    | ■                    | ■                          | ■                       |
| User-definable OCR zones                                              | ■                                    | □                                  | ■              | ■                    | ■                    | ■                    | ■                          | ■                       |
| Can recognize column text                                             | ■                                    | ■                                  | ■              | ■                    | ■                    | ■                    | ■                          | ■                       |
| Can recognize text flow on a single page                              | ■                                    | ■                                  | ■              | ■                    | ■                    | ■                    | ■                          | ■                       |
| Text flows across multiple pages                                      | ■                                    | ■                                  | ■              | ■                    | ■                    | ■                    | ■                          | ■                       |
| Can recognize tabular text                                            | ■                                    | ■                                  | ■              | ■                    | ■                    | ■                    | ■                          | ■                       |
| <b>Drawing Annotation Tools</b>                                       |                                      |                                    |                |                      |                      |                      |                            |                         |
| Bezier curves/ellipses                                                | ■ ■                                  | ■ ■                                | ■ ■            | ■ ■                  | ■ ■                  | ■ ■                  | ■ ■                        | ■ ■                     |
| Lines/Freehand lines                                                  | ■ ■                                  | ■ ■                                | ■ ■            | ■ ■                  | ■ ■                  | ■ ■                  | ■ ■                        | ■ ■                     |
| Rectangles                                                            | ■                                    | ■                                  | ■              | ■                    | ■                    | ■                    | ■                          | ■                       |
| Sticky notes/Text annotation                                          | ■ ■                                  | ■ ■                                | ■ ■            | ■ ■                  | ■ ■                  | ■ ■                  | ■ ■                        | ■ ■                     |
| Places annotation fields directly on image                            | ■                                    | ■                                  | ■              | ■                    | ■                    | ■                    | ■                          | ■                       |
| <b>Internet E-Mail Support</b>                                        |                                      |                                    |                |                      |                      |                      |                            |                         |
| Reads HTML                                                            | ■                                    | ■                                  | ■              | ■                    | ■                    | ■                    | ■                          | ■                       |
| Integrates with Web browser                                           | ■                                    | ■                                  | ■              | ■                    | ■                    | ■                    | ■                          | ■                       |
| Supports VIM/MAPI                                                     | ■ ■                                  | ■ ■                                | ■ ■            | ■ ■                  | ■ ■                  | ■ ■                  | ■ ■                        | ■ ■                     |
| Sends/receives e-mail                                                 | ■ ■                                  | ■ ■                                | ■ ■            | ■ ■                  | ■ ■                  | ■ ■                  | ■ ■                        | ■ ■                     |
| Indexes e-mail                                                        | ■                                    | ■                                  | ■              | ■ (images only)      | ■                    | ■                    | ■                          | ■                       |

\* The product's zoom feature does not specify percentages of the original size.

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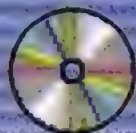
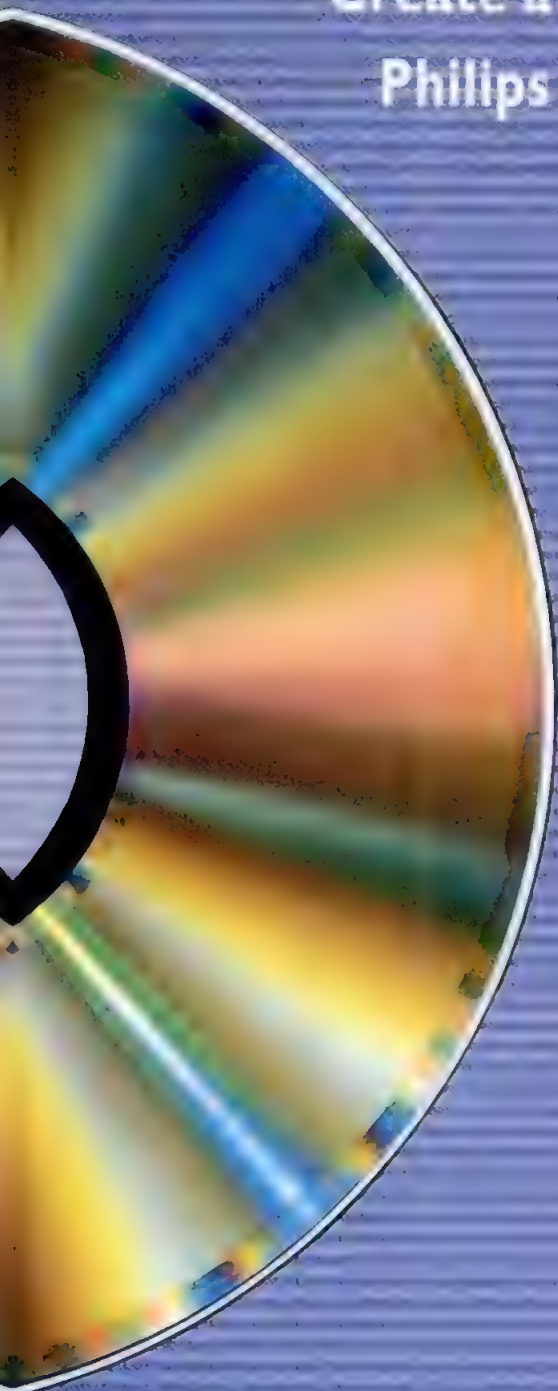
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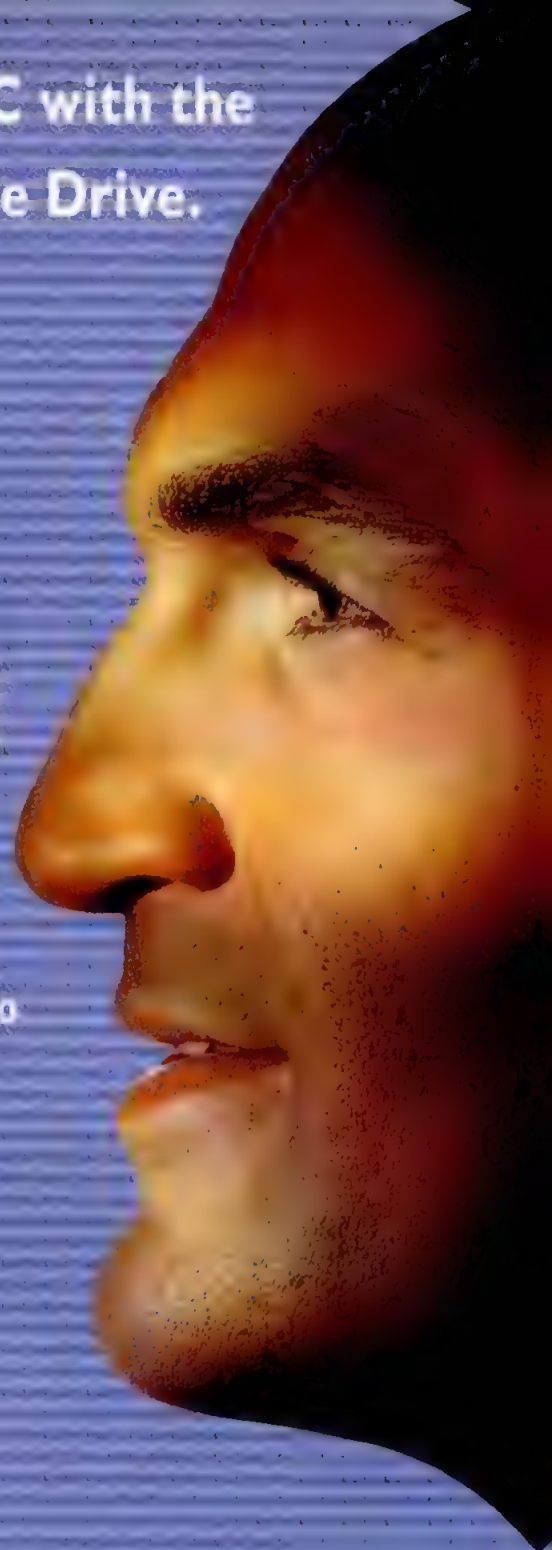
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printed into PaperMaster go either to an in-box or directly to a folder. If a scanned document looks similar to ones that you've saved previously, PaperMaster's auto-save feature will recommend a folder where the new file should be saved.

In PaperMaster, you can give a document a name and assign it to a specific folder, but you can't assign keywords, dates, users, and so on. PaperMaster does give you the ability to add pages, annotate, and perform OCR on documents in the in-box. PaperMaster supports full-text indexing, and you can perform straight text, Boolean (OR only), and fuzzy

searches, or you can limit your search to a specific file cabinet.

PaperMaster adds a hot button to your browser that lets you dump Web pages into the application. You can store Web pages intact, including HTML, the URLs, and the image files (Hot Save); as raster images only (Hot Print); or both. If you want the ability to index a Web page, you have to use Hot Print to send the page to the filing cabinet. When you use Hot Save, all of a Web page's links are preserved. If you click on a hyperlink, PaperMaster launches your browser and displays the page.

The biggest weakness in PaperMaster

is the interface. Although it is designed to make the program easier to use, we found it can actually hinder productivity if you work with a lot of documents on a range of topics. Nevertheless, the simplicity of the file-cabinet concept may appeal to some users, and the Web browser integration is a nice bonus.—DAH

**PaperMaster Live 3.0.** Street price: \$100. Requires: 486-based PC or better, 16MB RAM, 15MB hard disk space, Microsoft Windows 95 or Windows NT. DocuMagix Inc., San Jose, CA; 800-362-8624, 408-434-1138; fax, 408-434-0915; [www.documagix.com](http://www.documagix.com). *Circle 446 on reader service card.*

## OTHER OPTIONS FOR IMAGING

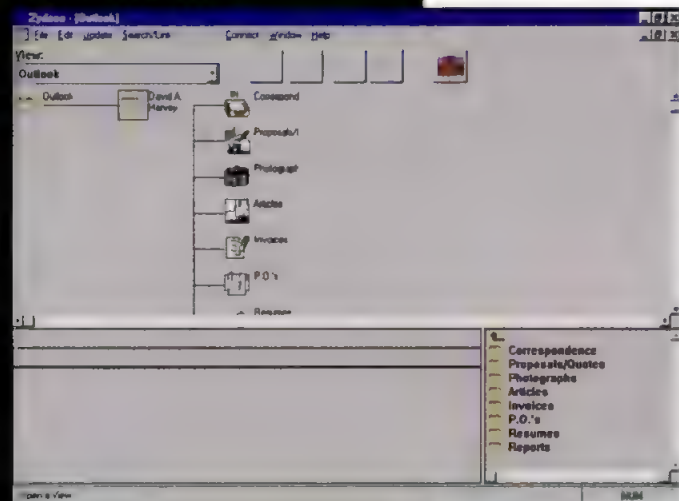
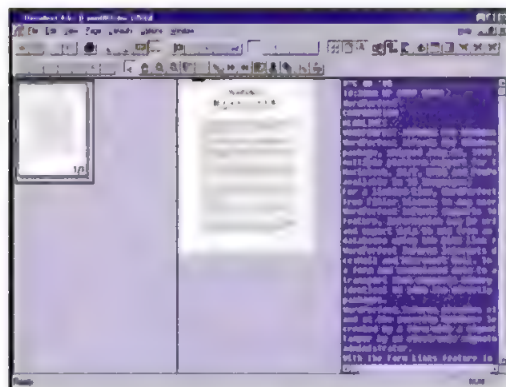
**W**ith names like MindWorks and Zydeco, it's no surprise that these companies sell some intriguing products. Neither MindWorks Corp.'s Recollect nor Zydeco Software's Zydeco for Microsoft Office quite fits in our main review. (Recollect is still in beta at this writing, and Zydeco lacks OCR and is not a general-purpose application), but both merit some discussion because their unusual features may appeal to some audiences.

Recollect 95 costs \$100 (street) and should be available by the time you read this. Zydeco (\$50 street) is available in versions for Microsoft users, ACT!, Quicken, or any ODBC-compliant database.

### RECOLLECT ▶

Building on the strengths of the \$349 Recollect Gold, Recollect adds 32-bit support and a long list of features.

Recollect comes with strong traditional document management: annotation, the ability to convert virtually any document on your hard disk into its filing system, and accurate full-text, fuzzy search capabilities. But what distinguishes Recollect is its ability to deal with multiple sets of document folders stored on hard disks, removable drives, and the network. All the user need do is to instruct Recollect to find drawers on any of the three types of media. (MindWorks Corp., Sunnyvale, CA; 800-683-8005, 408-730-2100; [www.mindworks.com](http://www.mindworks.com). *Circle 449 on reader service card.*)



### ◀ ZYDECO

Designed to integrate with Microsoft Access, Zydeco creates a database of images based on the database structure you've created in Access or Outlook. It then creates subfolders under each contact in Outlook where you can store images of documents. Unfortunately, Zydeco neither supports full-text indexing nor includes any OCR software, and it supports indexing only by the fields already in Outlook (contact name, company name, and so on).

Zydeco for ACT! offers more functionality, including the ability to search on notes and titles, and better integration. For the Office version, however, the outlook remains dim. (Zydeco, A Division of Information Technology Solutions, New Orleans; 888-225-5487, 504-539-9300; [www.itssoftware.com](http://www.itssoftware.com). *Circle 450 on reader service card.*)—DAH





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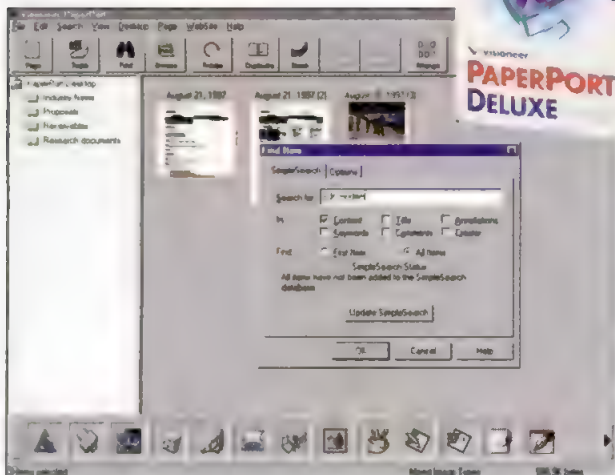
Visioneer Inc.

## PaperPort Deluxe



PaperPort Deluxe 5.1 (\$100 street) is appealingly easy to operate and should fulfill the needs of many users. New features and swift searching capabilities make this version the best solution overall for managing your documents and images.

PaperPort works well with your scanner software and existing applications. When you click on the scan icon in PaperPort's



**PaperPort's search capabilities are simple to use, but the most powerful features, such as Boolean searching, aren't documented.**

toolbar, the program loads your scanner's own interface. After scanning, PaperPort adds thumbnails of documents to its desktop. Dragging and dropping one thumbnail onto another creates a multipage document. You also can drag documents to any user-defined folder or subfolder.

PaperPort can automatically apply OCR for indexing purposes. Afterward, you can add keywords, a title, and comments to each document, and the program can search for those items. Conveniently, it can update its index when your PC has been idle for a specified period.

One indexing glitch deserves mention. PaperPort won't perform OCR and indexing if you scan the document in color, the default setting for many scanner drivers. The program doesn't warn you about this, so when you search for a document that has been scanned incorrectly, you won't find it. Also, PaperPort indexes only documents scanned into the program, not other files on your hard disk, unlike Pagis

Pro 97. However, you can import images saved in virtually all popular formats into PaperPort's interface.

PaperPort's solid search capabilities include fuzzy queries; you use a slider bar to adjust how closely the fuzzy search should match the actual words. It also supports Boolean and wildcard searches, though those features are undocumented.

Search results are ranked by relevance.

You can't launch PaperPort's scanning process from within other applications, but it's easy to move documents from PaperPort to other programs. Each time you load PaperPort, it examines your system for programs for which it supplies links (currently about 185, according to Visioneer), then it adds icons for those programs to the PaperPort interface. When you drag a scanned document to an application icon, depending on the application you've selected, PaperPort either starts the OCR

process and launches the application with the text loaded or inserts the image file into the selected program.

The ScanDirect toolbar makes integration even simpler for users of Visioneer scanners. If you place a document in your

scanner and click on a ScanDirect icon, the program scans and inserts the document into your application even if PaperPort and the other application aren't loaded. Better yet, if PaperPort is already loaded and you're not using ScanDirect, you don't even need to click its icon to activate scanning with a Visioneer scanner.

PaperPort uses TextBridge Lite for OCR tasks. New image-editing tools in this version allow you to fine-tune brightness, contrast, color, and tint, and to remove red-eye from snapshots.

PaperPort Deluxe 5.1 is simply the easiest way to get paper into your PC.—*DH*  
**PaperPort Deluxe 5.1.** Street price: \$100. Requires: 486-based PC or better, 8MB RAM, 25MB hard disk space, Microsoft Windows 95 or Windows NT 4.0. Visioneer Inc., Fremont, CA; 800-787-7007, 510-608-6300; [www.visioneer.com](http://www.visioneer.com). Circle 447 on reader service card.

TDF Corp.

## Personal Image Edition

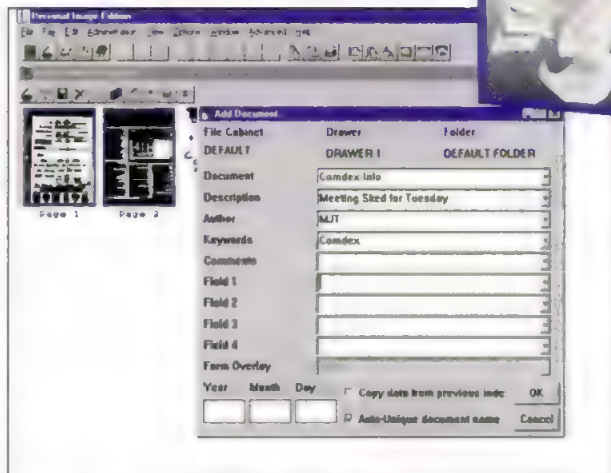
Following the trend started with Internet software, TDF Corp. has put a free, full-featured version its Image Edition client on the Web. Given its price, Personal Image Edition 3.0 is a powerful program, though it lacks integrated OCR, and its search procedure is inefficient. A network version (\$3,450 list for the first user and \$1,000 per added user) is available.

In all respects, Personal Image Edition

is a solid document-imaging product. All the basics are present, including a storage system organized according to file cabinets, drawers, folders, and documents.

Personal Image Edition supports both Twain and ISIS scanners as well as a healthy array of image file formats. It can also directly import text files and link nontext files to the applications that created them.

The program doubles as a standalone send/receive fax application, and its printer driver lets you



**Personal Image Edition lets you arrange pages of a batch into a document and index it while you view the image thumbnails.**



rasterize document files into the storage system. The innovative Image Mailer allows you to "wrap" an image file in a viewer to send as e-mail.

What's missing from Personal Image Edition is fully integrated OCR. Instead, the program has hooks to Xerox Corp.'s TextBridge Pro, but only to transfer document images into word processors. Also missing are image editing tools, except for sticky notes, despeckling, contrast and color adjustment, and so on.

Getting started with Personal Image Edition is fairly simple: You create a folder structure, and you can choose to password-protect folders or to assign a set of predefined or custom keywords to the index fields. Then the Acquire window lets you import batches of files or start scanning documents. Acquired files appear as thumbnails. Here you can collate documents and send them to the file system.

Personal Image Edition's indexing is fairly basic. You can type your own keywords into the index fields or select predefined terms from a drop-down list and enter the date. Index information can be carried

over from document to document. One feature allows you to "reacquire" or return a document to the in-box, where you can reindex the document or insert pages.

The search facility is powerful but poorly implemented. It allows you to search index fields, sticky notes, and ASCII text (in imported files), and to use Boolean operators to find multiple terms. But instead of getting a list of matching documents, you get a window with a cabinet icon. You then have to drill down through drawers and folders that contain matches to get to individual documents. Once you reach the first matching document, you have to navigate between folders to see the next match.

Still, Personal Image Edition's price can't be beat, and most of the basic features for simple document storage and retrieval are in place.—DAH

**Personal Image Edition 3.0.** List price: Free. Requires: 486-based PC or better, 8MB RAM, 1MB hard disk space, Microsoft Windows 95 or Windows NT 4.0. TDF Corp., Blue Ridge Summit, PA; 800-848-4833, 717-794-5859; [www.tdfcorp.com](http://www.tdfcorp.com). Circle 441 on reader service card.

NewSoft Inc.

## Presto! PageManager

What if the Three Musketeers changed their slogan to "Every man for himself"? Just wouldn't inspire the same confidence, would it? That's the problem with NewSoft's Presto! PageManager 3.0 (\$50 street).

The package has three applications: Image Filing Cabinet, Disk Explorer, and Webpage Manager. While each component is a capable musketeer, the problem is that they don't work well together. The result is that you can't store all your Disk Explorer files (except for image files) or HTML files alongside image files, nor can you search across these document types.

Image Filing Cabinet is PageManager's interface for scanned documents. Disk Explorer is NewSoft's version of the Windows Explorer; it offers a hierarchical view of your hard disk. Finally, Webpage Manager lets you browse the Web, open local HTML files, and download HTML documents to your hard disk. All the files you download are stored in application folders similar to



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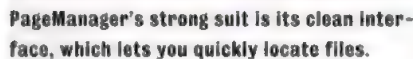
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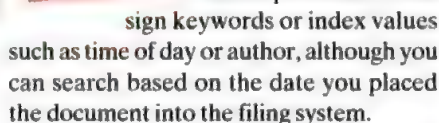
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Each component in PageManager shares the same interface, consisting of the usual menu and toolbar across the top and a workspace split into a folder navigation view on the left and a contents view on the right. Below the status bar on the



The simple full-text search does a good job of finding documents in Image Filing Cabinet. The fuzzy-logic search lets you adjust sensitivity (0 to 100 percent).

bottom are a series of application icons, similar to those in Visioneer's PaperPort Deluxe, which allow you to send pages via fax or e-mail or to any other defined applications—but not to the other modules within the program.

PageManager's approach to document management relies heavily on folders and on text that has been extracted from image files by OCR. There is no facility to set up document profiles or to as-

To insert a document into PageManager, you can use your scanner, or you can import existing image files from your hard disk. Scanned and imported pages end up in the in-box folder as thumbnails (a stack for multiple pages). PageManager failed to handle multiple-page fax files, extracting only the first page.

PageManager's all-in-one approach to scanned documents, images, and Web pages—like that of Documagix's PaperMaster Live—sounds promising. But in this case, the whole is less than the sum of its parts.—*DAH*

**Presto! PageManager 3.0.** Street price: \$50. Requires: 486-based PC or better, 4MB RAM, 20MB hard disk space, Microsoft Windows 95 or better. NewSoft Inc., Fremont, CA; 800-436-4365, 510-445-8600; fax, 510-445-8601; [www.newsoftinc.com](http://www.newsoftinc.com). *Circle 448 on reader service card.* 

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# SOHO SCANNERS

In the world of big business, heavy-duty flatbed scanners have served as the main means of cramming every conceivable document or image into electronic format. Other kinds of scanners just didn't deliver the paper-handling finesse and quality needed to manage a variety of document types.

Although flatbeds are probably still the scanners of choice for larger projects (scanning a variety of text documents, photographs, and other images), sheet-fed scanners

With color, quality that rivals flatbeds, and low prices, sheet-fed scanners come into their own.

*By David A. Harvey*

have recently stepped up to the challenge, addressing small-office and home-office needs—and sometimes at half the price of some flatbeds. Whether you need to scan credit card receipts, office memos, 8- by 10-inch glossy color photos, or graphics for your home page, our tests revealed that sheet-fed scanners are now up to the task.

If you're not sure yet which kind of scanner fits your needs, see the sidebar "Sheet-Feds and Flatbeds Go Head to Head," which takes a closer look at the pros and cons of



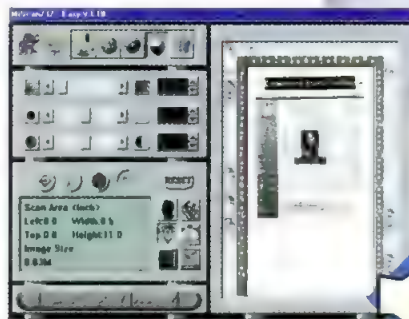
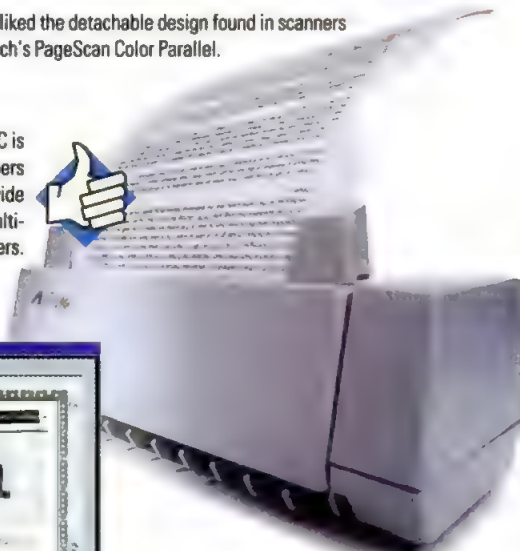
## The Highs and Lows of Color Sheet-Feds



We really liked the detachable design found in scanners like Logitech's PageScan Color Parallel.



The Avison AV100C is one of the scanners that provide convenient multi-sheet feeders.



The Avison AV100C comes with a crowded, confusing Twain dialogue.



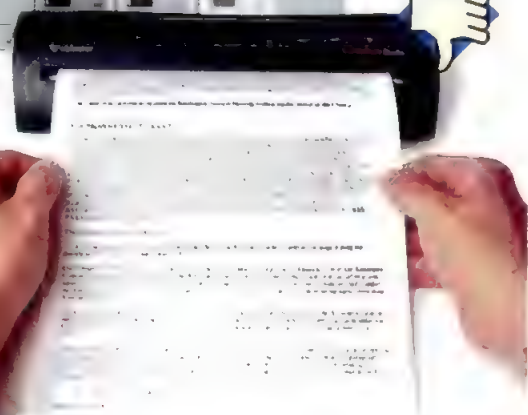
With an oversized SCSI-to-parallel port and a short cord, the Microtek Color PageWiz doesn't make good use of space.



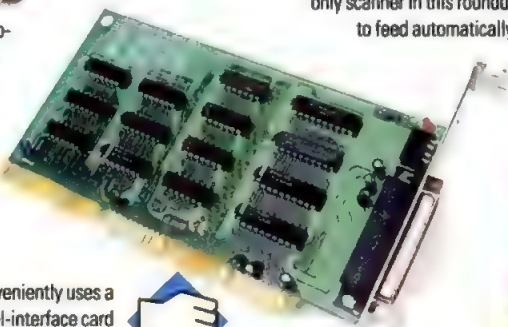
The Visioneer Strobe comes with an Adjust Picture dialog box, a slick WYSIWYG interface. It was the only scanner in this roundup to feed automatically.



The Visioneer Strobe lacks paper guides.



The Proton ScanPro inconveniently uses a proprietary ISA parallel-interface card to connect scanner and PC.



each. In addition, by the time you read this, Logitech will have released two up-and-coming sheet-fed scanners that weren't available in time for our in-depth testing. Take a look at our preview of them in our sidebar "A Pair of Logitech Scanners."

For this roundup, the 11 scanners we tested all met four criteria: support for color scanning, a sheet-fed design, compliancy with Twain (the software standard that

connects scanners to applications, sometimes interpreted as an acronym for "Technology Without An Interesting Name"), and a street price under \$300. In addition, several of these scanners also come with automatic document feeders (ADF) that can handle 20 or more pages, as well as handy software bundles that include document-imaging packages (reviewed in our feature "Taming the Paper Tiger" in this issue),

standalone OCR programs, and image-editing tools. For more information about scanners devoted purely to pictures, take a look at our sidebar "Smile, Click, and Scan."

Most of the scanners we examined featured a true optical resolution of 300 dpi or higher, except for the 200-dpi Logitech PageScan Color Parallel. Scanners also fall into one of two categories: single-sheet, such as the Visioneer PaperPort Strobe

and the Microtek Color PageWiz, and multifeed, such as the Eastman Kodak PhotoDoc Color Scanner and the Logitech PageScan Color Parallel. Multifeeds tend to work more efficiently than sheet-fed scanners—thanks to their ability to scan in large amounts of paper continuously—although the Strobe can work nearly as efficiently, because it's the only scanner in this roundup that automatically pulls the paper through upon sensing it.

Our tests results show that each of the sheet-fed scanners has room for improvement. We ran three types of tests—performance tests and two kinds of quality tests (technical tests performed by a service bureau) and more informal jury tests—and none of the 11 scanners fared superbly in all three categories.

In addition, we found that differences appeared between the jury test results and the findings of the complementary technical-quality tests performed by a service bureau that specializes in the analysis of scanner images. For example, although the Mitsubishi S600C ranked excellent on our jury tests for overall color accuracy and is one of the faster scanners, its black-and-white output was decidedly average on the detailed quality tests—which examine, for example, the amount of blackness, the degree of noise, and the level of uniformity.

The difference here is that the quality tests measure minute discrepancies in the scans that may not necessarily show up on the screen or on a relatively low-resolution printer (600-dpi or less). If precision matters most to you, look primarily at the quality results. If you care more about how your scanned images look to the naked eye, our jury results may prove more useful to you. And, of course, you have to decide whether waiting under half a minute, 2 minutes, or more than 5 minutes for a document to scan makes a big difference to you. Your SOHO scanning needs dictate your choice of scanner.

## Editors' Choice

### • Logitech PageScan Color Parallel



*For SOHO and home users, the Logitech PageScan Color Parallel is the best choice among the color sheet-fed scanners we tested. We had hoped to find a scanner*

that excelled in all areas, but at this time, perhaps that's too much to ask of a scanner priced under \$300. Nevertheless, the PageScan Parallel comes closest, offering a flexible design, relatively fast scan times, and quality reproduction.

The PageScan Parallel facilitates reliable paper handling. It's also one of the few scanners in this roundup that comes with a convenient detachable head for hand-scanning bound and oversize documents, as well as a detachable sheet feeder. And on our performance tests, the PageScan Parallel produced consistently acceptable results. Though the product's technical quality is mixed, its color reproduction is among the most accurate of the test group.

The PageScan Parallel ships with DocuMagix's PaperMaster 3.0 Limited Edition, but if you want to enhance the document-imaging capabilities, we recommend you purchase Visioneer's PaperPort Deluxe 5.1 (\$100 street).

PaperPort is our Editors' Choice for document imaging (for a review, see "Taming the Paper Tiger" in this issue). Together, the PageScan Parallel and PaperPort Deluxe will provide you with a powerful and flexible personal imaging solution for about \$300.

Of course, Visioneer is also a hardware manufacturer. And its entry in the color sheet-fed scanner market, the new PaperPort Strobe (\$230 street), merits an honorable mention. The Strobe is the only scanner in this roundup that automatically scans paper as soon as the feeder senses it. On our tests, the Strobe posted the fastest black-and-white text time, and the included PaperPort software makes this scanner an excellent solution for document imaging. The product did not fare as well on color, with one of the slowest scan times we recorded and mediocre color quality. Nevertheless, if you do not plan to scan color images, the Strobe, with its included software, is an excellent document-imaging solution.

And someday, you'll probably be able to find all three attributes—great performance, great features, and great quality—in an inexpensive scanner. But for now you must choose what you need most. Keep in mind, though, that these sheet-fed scanners have come quite a long way since we last reviewed them, in our issue of October 24, 1995. The future should hold even more changes for color sheet-fed scanners.

### Avision AV100C

This boxy scanner from Avison is not likely to win any awards for its design or for its overall scanning prowess. The Avison AV100C (\$200 street) does handle large quantities of black-and-white documents well, but its technical quality and Twain driver were less impressive.

The AV100C attaches simply to your PC via a parallel cable. But the scanner's Twain dialog is a confusing hodgepodge of controls. For example, the auto-crop feature did not take an odd-sized output and automatically crop it to the borders of the scanned image. And the Twain dialog box had no help files.

We found that the AV100C can scan a surprisingly large amount of paper consistently—as much as 35-page stacks of 8.5-

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by 11-inch paper with text. But although the AV100C can handle a lot of documents at one time, thinner or

smaller paper tended to slip on the roller. Business cards slipped so much that when we set the paper size to business card, we ended up with a blank scan. To feed a business card properly, we had to press gently on the top of the card as it began to be scanned.

The AV100C didn't fare well on our quality tests, with average to poor rankings. In our speed trials and jury tests, the AV100C proved a little stronger, with acceptable times and clear reproductions.

The AV100C we tested came with a beta version of Visioneer's document-imaging package PaperPort 5.1, which should come standard with the unit by the time you read this.

Ultimately, the AV100C is best suited for pulling in large stacks of paper in black-and-white mode: In this case, you may be better off with a flatbed scanner.—David A. Harvey

**Avision AV100C.** Street price: \$200. Avison Inc., Fremont, CA; 800-995-8999, 510-440-8785; fax, 510-440-8337; www.avision.com. *Circle 451 on reader service card.*

### Eastman Kodak PhotoDoc Color Scanner

Designed primarily for photo scanning, the Eastman Kodak's PhotoDoc Color Scanner (\$250 street) includes a user-friendly software bundle but lacks a document-imaging package. In testing, we encountered some operability problems with the PhotoDoc.

The Twain driver interface in the PhotoDoc is perhaps too user-friendly, because it hides some of the scanning controls you want to access. The PhotoDoc fed all of our test documents quickly and reliably when they were inserted properly, but it jammed them badly when we inserted the documents on a slant to test its handling of that situation.

The PhotoDoc delivered mixed test performances, from among the worst (in

color) to fourth place (in black and white). On our jury tests, it landed in the bottom half of the scanner group, and its results on our technical-quality tests were weak.

The PhotoDoc is the only scanner we reviewed that doesn't come with any document-imaging software. Its anchor application is Microsoft's Picture It!, a program that lets you scan in photos and arrange them as collages. But make sure you change Picture It!'s photographic setting to professional prior to scanning; otherwise you might run into operability problems. The PhotoDoc integrates well with its other bundled software—MetaTools' Kai's Power GooSE, Kodak's Picture Postcard, and Caere's OmniPage LE, an OCR package.

With its "family-friendly" approach and handy home software bundle, the PhotoDoc is a decent choice if you intend to scan a lot of photos and have only basic scanning needs. But for heavy-duty sheet-fed scanning, you'd probably want a product like the Logitech PageScan Color Parallel, which includes document-imaging software.—Stephen Plain

**PhotoDoc Color Scanner.** Street price: \$250. Eastman Kodak Co., Rochester, NY; 888-375-6325, 716-726-7260; fax, 888-375-6325; www.kodak.com. *Circle 452 on reader service card.*

### Hewlett-Packard ScanJet 5s

The Hewlett-Packard name has long been synonymous with quality imaging peripherals. Unfortunately, the company's first entry into the color sheet-fed scanner market, the ScanJet 5s (\$200 street), is slow and noisy, and it exhibited mediocre performance on our quality tests.

The ScanJets 5s can scan up to 25 pages consecutively, though it failed to detect the correct length of a newspaper clipping with an irregularly shaped bottom. The scanner's interface and Twain driver are its strongest features. Instead of a dialogue with setting buttons and slider bars, the interface has a series of buttons that relate to different tasks: e-mailing, faxing, OCR handling, filing, copying, printing, and picture manipulating. For heavy-duty image handling, the

scanner's Twain driver offers more advanced settings for adjusting resolution, page size, gamma controls, brightness, and contrast.

On our performance tests, the ScanJet 5s did not fare well. It was one of the slower scanners for color in this roundup, and its technical quality was decidedly average. On our jury tests, the image it produced looked washed out.

The ScanJet 5s comes bundled with a licensed version of Visioneer's PaperPort made for Hewlett-Packard, as well as a limited edition of Caere's OmniPage. Overall, we expected more from an HP scanner, but given the company's track record and the ScanJet's newness to the market, it will probably include improved future versions of output, speed, and operability.—DAH

**ScanJet 5s.** Street price: \$200. Hewlett-Packard Co., Palo Alto, CA; 800-722-6538, 415-857-1501; fax, 800-333-1917; www.hp.com. *Circle 453 on reader service card.*

### Logitech PageScan Color Parallel



With one of the most accurate color reproductions and the best showing in this roundup, the Logitech PageScan Color Parallel (\$200 street) stands out from the rest of the pack.

The PageScan Parallel comes with a slew of customizable scanner settings yet doesn't offer a preview screen, and it's the only 200-dpi scanner in this roundup even though it can interpolate at 300 dpi. We like how the detachable scanner head fits conveniently in your hand. The motor drags the scanner along documents at an even speed, and scanning bound documents or small images worked effortlessly.

The unit's Automatic Document Feeder handles paper with finesse: It tries to straighten pages that are inserted in a slanted manner, and if it can't straighten them, it feeds them back, avoiding any damage.

The PageScan Parallel was one of the few in this roundup that delivered consistently acceptable performance. On the

**Our Contributors:** BILL DYSZEL and DAVID A. HARVEY are frequent contributors, and STEPHEN PLAIN is a contributing editor of *PC Magazine*. BEN Z. GOTTESMAN is a technical director at *PC Magazine*. DIANE JECKER was the project leader, and YVONNE KOULOUTHROS was the staff editor in charge of this story.




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## A Pair of Logitech Scanners

**W**ith what seems like a divide-and-conquer strategy, Logitech is readying two sheet-fed color scanners, the FreeScan and the PageScan USB, for shipment this winter.

We tested a beta version of the higher-end FreeScan (\$300 street), bundled with DocuMagix's PaperMaster 3.0, Xerox TextBridge OCR, Adobe PhotoDeluxe 1.0, and an alpha version of Logitech's ImageWare 3.1 software. The detachable FreeScan offers true 600-dpi optical resolution coupled with a maximum of 30-bit color depth, as well as 1-bit monochrome and 8-bit gray-scale support and a maximum interpolated resolution of 4,800 dpi. But while test scans yielded mostly good results, Logitech had not yet completed the portions of the software that handle gamma correction and other tonal balances, so we weren't able to evaluate these functions in the FreeScan. (Keep in mind that we did not run jury tests or the in-depth technical-quality tests on these units.)

Logitech's soon-to-be-released PageScan USB (Universal Serial Bus) is a single-sheet scanner that easily uses the USB for both power and a connection to the PC. This \$230 street scanner delivers 300-dpi optical resolution and an interpolated maximum resolution of 2,400 dpi. It supports 1-bit black and white, as well as 8-bit gray and 24-bit color. Text appeared crisp and clean, and color photographs were close to the originals.

The FreeScan and the PageScan USB each have a button



Both the FreeScan (left) and the PageScan USB (right) produced clear color reproductions on our informal tests, though the PageScan USB generated some overly orange tones.

that either initiates or stops scans, and each has a paper sensor that calls forth the scanning software. But unlike the FreeScan, the PageScan USB doesn't include document-imaging software. ScanBank, a new application that is essentially a thumbnail-based scrapbook, lets you perform rudimentary image manipulation. The PageScan USB is also bundled with Adobe PhotoDeluxe 1.0 and Xerox TextBridge OCR.

The PageScan USB is not the scanner for those who want to manage multiple pieces of paper or who need robust document imaging—look to the FreeScan for that. But if you don't have heavy-duty scanning needs, the PageScan USB is a convenient choice.—DAH

**FreeScan.** Street price: \$300. **PageScan USB.** Street price: \$230. Logitech Inc., Fremont, CA; 800-231-7717, 510-795-8500; fax, 510-792-8901; [www.logitech.com](http://www.logitech.com). Circle 456 on reader service card.

jury tests that focused on color accuracy, the PageScan Parallel placed in the top three. And on our technical-quality tests, results were average.

The PageScan Parallel comes with DocuMagix's PaperMaster 3.0 Limited Edition. Since the scanner is so inexpensive, we recommend you use the money saved to buy Visioneer PaperPort Deluxe 5.1 (\$100 street) for document imaging. Besides PaperMaster, the PageScan Parallel also comes bundled with Adobe PhotoDeluxe and Logitech's ImageWare 3.0. The latter lets you access QuickText, which includes Xerox's TextBridge OCR, QuickPicture, and printer/fax buttons.

All in all, the detachable PageScan Parallel performed pretty well. We'd like to see 300-dpi resolution and stronger document-imaging software, but of the current crop of sheet-fed scanners, the

unit is the best choice.—DAH

**PageScan Color Parallel.** Street price: \$200. Logitech Inc., Fremont, CA; 800-231-7717, 510-795-8500; [www.logitech.com](http://www.logitech.com). Circle 456 on reader service card.

### Microtek Color PageWiz

The Color PageWiz (\$160 street) from Microtek Lab has made solid strides into the SOHO scanner market but gives a mixed performance. Although the PageWiz's operability has some rough edges, its output is strong.

Installation of the Color PageWiz could have been easier. A separate SCSI driver has to be added to the parallel port, and we experienced a couple of crashes before we got the scanner to work. But the PageWiz's Twain driver offers a variety of presets for quick acquisition and an array of advanced features

via a rather intuitive interface.

The Color PageWiz's motor doesn't correct for improperly inserted documents. More than once, inserting a document at an angle crashed both the scanner and the system.

The Color PageWiz's performance numbers were very irregular, a mix of fast and slow. Although it did quite well on the color page tests (coming in at a close third), it performed poorly on the black-and-white page test. On the other hand, the Color PageWiz was one of the few scanners in this roundup that delivered consistently acceptable image quality on our technical and jury tests.

One of the least expensive scanners in this roundup, the Color PageWiz comes bundled with Ulead's iPhoto Express, Adobe PhotoDeluxe, and Xerox Pagis Pro SE. The Color PageWiz is a decent



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\* Estimated street prices. All performance tests conducted by Matrox Graphics Inc. Windows NT 4.0 tests conducted on a Dell XPS H266 configured with an Intel Pentium® II, 290 MHz processor with 512K cache and 32 MB RAM. Matrox Millennium II, Diamond Stealth 3D 3000 and Number Nine Imagine 128 Series 2 were configured with maximum memory configurations using driver revisions 3.20, 3.20, 3.20, 2.03, 4.102.03 respectively. WinBench 97 business tests conducted at 1024x768@24-bit at 75Hz (or maximum refresh supported by the card) using small fonts under Windows NT. Pentium is a registered trademark of Intel corporation.

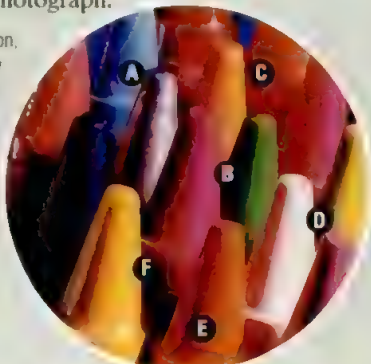
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## Comparing Scanner Output

The sample image below was produced on a Scitex drum scanner used for professional prepress work. This reproduction is as close as possible to the original photograph.

Look for color accuracy in each crayon, especially in the **silver and yellow crayons (A)**. **Highlight areas (B)** should show good detail. Better scanners will also reproduce the **horizontal swirls around the crayon tops (C)**. The **white crayon (D)** should be pure white. Detail and color accuracy should be maintained in **shadow areas (E)**, rather than a quick fade to black. The **edges of the crayons (F)** should be clearly delineated.



200 dpi is the maximum optical resolution. All other images are 300 dpi output.



**Avision AV100C**, \$200 street  
**Pros:** Can scan a lot of text, clear reproduction  
**Cons:** Poor uniformity, scans can slip off roller  
**Jury ranking:** 2nd **OCR accuracy:** 98.83%



**Logitech PageScan Color Parallel**, \$200 street  
**Pros:** Good reproduction, detachable, fast times  
**Cons:** Unimpressive software; poor uniformity  
**Jury ranking:** 3rd **OCR accuracy:** 98.06%



**Microtek Color PageWiz**, \$160 street  
**Pros:** Intuitive Twain driver; minimal distortion  
**Cons:** Awkward installation, doesn't straighten paper  
**Jury ranking:** 5th **OCR accuracy:** 95.85%



**Storm EasyPhoto SmartPage Pro**, \$150 street  
**Pro:** Very good reproduction  
**Cons:** Slowest text time; distorted scans  
**Jury ranking:** 4th **OCR accuracy:** 98.22%



**Tamarack DocuMan 1200C**, \$130 street  
**Pro:** Fine gray and black levels  
**Cons:** Poor reproduction; jammed easily  
**Jury ranking:** 10th **OCR accuracy:** 98.56%

**HARDWARE**  
*SOHO Scanners*



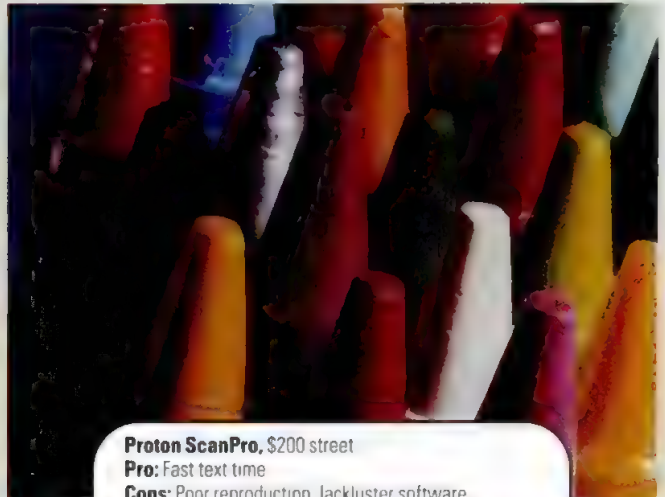
**Eastman Kodak PhotoDoc Color Scanner**, \$250 street  
**Pros:** Great for photos, extremely easy to use  
**Cons:** Very slow color time, no document-imaging software  
**Jury ranking:** 6th **OCR accuracy:** 98.24%



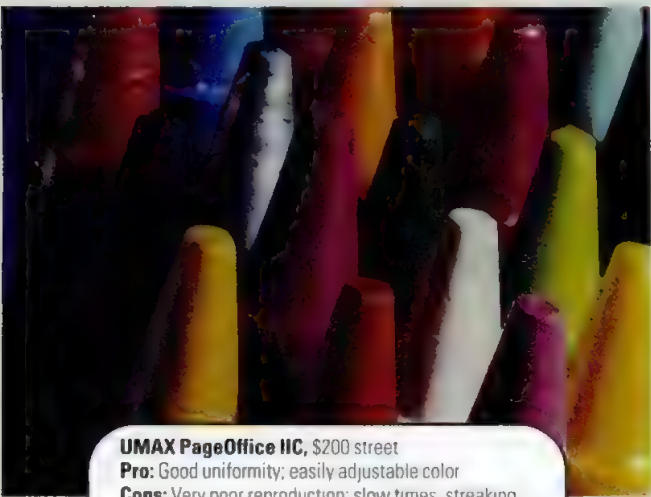
**Hewlett-Packard ScanJet 5s**, \$200 street  
**Pros:** Appealing interface and Twain driver  
**Cons:** Slowest color time; noisy, poor color  
**Jury ranking:** 7th **OCR accuracy:** 95.33%



**Mitsubishi S600C**, \$230 street  
**Pros:** Best reproduction, fast times  
**Cons:** Poorly integrated software; hard to install  
**Jury ranking:** 1st **OCR accuracy:** 97.06%



**Proton ScanPro**, \$200 street  
**Pro:** Fast text time  
**Cons:** Poor reproduction, lackluster software  
**Jury ranking:** 8th **OCR accuracy:** 97.85%



**UMAX PageOffice HC**, \$200 street  
**Pro:** Good uniformity; easily adjustable color  
**Cons:** Very poor reproduction; slow times, streaking  
**Jury ranking:** 9th **OCR accuracy:** 98.16%



**Visioneer PaperPort Strobe**, \$230 street  
**Pros:** Fastest text time; great software  
**Cons:** Slow color time; poor uniformity, streaking  
**Jury ranking:** 11th **OCR accuracy:** 97.56%





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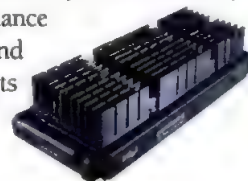
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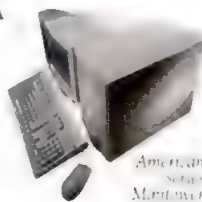


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- 56K\* US Robotics Modem
- 32-Bit Sound
- Altec Lansing ACS-90 Speakers
- Microsoft Windows®95
- Microsoft Office 97 Small Business Edition
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PERFORMANCE TESTS

# Color Sheet-Fed Scanners



Now that personal sheet-fed scanners include color support, they've become jacks-of-all-trades. To test how suitable the 11 scanners in our roundup were at these tasks, we ran a series of performance and quality tests.

## What the Numbers Mean

To assess color caliber, we ran a series of objective technical-quality tests on each scanner as well as subjective jury tests. The quality tests focused on very specific image details, and the jury tests primarily focused on the accuracy of color reproduction as judged by the naked eye.

The quality tests examined several factors, including *black level*, or the degree of "blackness"; *signal-to-noise ratio*, a measure of the difference between blacks and whites and the consistency of the blacks in the image; and *ghosting*, the presence of faint second images caused by reflections in the scanner. Failure to perform well on these quality tests could introduce problems if you choose to manipulate the image in an image-editing program or export it to a high-quality output device.

Except for the technical-quality tests, on which we ran the scanners at their maximum optical resolution, we performed all scanning at 300 dots per inch (dpi). To maintain a level playing field, we used the scanner's default settings; note that you can improve each scanner's output (or worsen it, for that matter) by adjusting the settings.

When scanning variously sized stacks of 8.5- by 11-inch black-and-white documents into document imaging-software programs (reviewed in "Taming the Paper Tiger"), speed is key. If a scanner takes too long to scan a stack of documents, you're likely to scan fewer documents and thus not take full advantage of the software. The Visioneer PaperPort Strobe, a scanner with its roots firmly planted in the document-imaging arena, needed only 9 seconds to be first to cross the performance finish line. At the other end of the spectrum, the recently released EasyPhoto SmartPage from Storm Technology took



six times as long on our text document. Consider, then, how this wide range of performance would make a difference when scanning a simple five-page report.

Results from our color photo-scanning test vary widely, from the Mitsubishi S600C (1 minute

33 seconds) to the Tamarack DocuMan 1200C (more than 3 minutes) to the Hewlett-Packard ScanJet 5s (more than 7 minutes). Some units simply feed the paper through the scanning mechanism faster; others either move it more slowly, pause more frequently, or—like the ScanJet 5s and the Proton ScanPro—read the image into memory without giving you access to your computer right away because they take it over. Keep in mind that if you tend to scan fewer color images than black-and-white documents, you may be more tolerant of slow color scans.

For the sake of comparison, we scanned both color and black-and-white image types at 300 dpi. In the case of the color image, this created a 20MB file. With many applications, you can scan color images at lower resolutions with very acceptable results. (If you're scanning a document for filing in a document-imaging program, you are less likely to use a 200-dpi resolution. OCR requires 300-dpi scans for adequate results.) In the end, we found very little correlation between the time required to scan black-and-white documents and the time to scan color images. Nor was speed indicative of quality.

The OCR tests showed that minor differences in scan quality, most imperceptible to the human eye, can cause significant differences in OCR quality. We scanned the same stack of documents through each scanner and processed them in Caere OmniPage Pro. A difference of 5 percent could mean 25 to 30 additional word errors per page. This substantially decreases the accuracy of the converted text and increases the time needed to correct it.

The color samples for our jury tests appear on the previous pages. The top scanners—the Mitsubishi S600C, the Avision

*Continues*

### TECHNICAL-QUALITY TESTS

- Good
- Acceptable
- Poor

|                                      | Resolution<br>(line pairs per mm) | Aspect<br>Ratio | Black Level | Signal-to-<br>Noise | Ghosting | Dynamic<br>Range | Uniformity | Color<br>Registration |
|--------------------------------------|-----------------------------------|-----------------|-------------|---------------------|----------|------------------|------------|-----------------------|
| Avision AV100C                       | 5                                 | ●               | ●           | ●                   | ●        | ●                | ●          | ●                     |
| Eastman Kodak PhotoDoc Color Scanner | 5                                 | ●               | ●           | ●                   | ●        | ●                | ●          | ●                     |
| Hewlett-Packard ScanJet 5s           | 5                                 | ●               | ●           | ●                   | ●        | ●                | ●          | ●                     |
| Logitech PageScan Color Parallel     | 4                                 | ●               | ●           | ●                   | ●        | ●                | ●          | ●                     |
| Microtek Color PageWiz               | 4                                 | ●               | ●           | ●                   | ●        | ●                | ●          | ●                     |
| Mitsubishi S600C                     | 5                                 | ●               | ●           | ●                   | ●        | ●                | ●          | ●                     |
| Proton ScanPro                       | 5                                 | ●               | ●           | ●                   | ●        | ●                | ●          | ●                     |
| Storm EasyPhoto SmartPage Pro        | 5                                 | ●               | ●           | ●                   | ●        | ●                | ●          | ●                     |
| Tamarack DocuMan 1200C               | 4                                 | ●               | ●           | ●                   | ●        | ●                | ●          | ●                     |
| UMAX PageOffice IIC                  | 4                                 | ●               | ●           | ●                   | ●        | ●                | ●          | ●                     |
| Visioneer PaperPort Strobe           | 5                                 | ●               | ●           | ●                   | ●        | ●                | ●          | ●                     |

## PERFORMANCE TESTS

*Continued*



AV100C, and the Logitech PageScan Color Parallel—all reproduced our crayon image faithfully. Some scanners displayed streaking in the image. The Visioneer PaperPort Strobe, for example, performed very inconsistently; it was the only scanner to exhibit both vertical and horizontal streaking.

## How We Tested

We ran all the tests on a 133-MHz Pentium-based Micron Milenia with 32MB RAM and a 2.1GB Conner hard disk.

Our quality tests were designed and performed by KDY Associates, a Nashua, New Hampshire-based firm specializing in the analysis of scanners, which used its software tool Image Xpert. ImageXpert, an industry standard that automates the analysis of image quality at the subpixel level, is based on Image Analyst by Acuity Imaging, an RVSI Company. PC Labs provided KDY with a scan of a specially designed test target in 24-bit color and a gray-scale mode, both at each scanner's highest optical resolution, using all other default settings.

The **Resolution** test examines the maximum number of line pairs that can be resolved per millimeter; higher scores represent better output. This test measures the scanner's focus rather than its optical resolution. An out-of-focus scanner will produce a blurred image in which discrete lines in close proximity tend to converge.

The **Aspect Ratio** test involves separate measurements of the horizontal and vertical magnification of the original image. An aspect ratio other than 1.0 indicates distortion.

The **Black Level** test evaluates how black is reproduced by the system. Pure black should have a value of 0 on a scale of 0 to 255 (pure white). Scanners that received a *good* rating all had scores below 1.0. Black levels below 24 resulted in acceptable scores.

The **Signal-to-Noise** test is a measure of the scanner's black-to-white range, divided by the standard deviation of the

image's black level. In other words, we analyzed the breadth of gray levels that can be reproduced, divided by the consistency of the blacks within the image.

The **Ghosting** test measures how well the scanner minimizes internal reflections that might cause a faint second image to appear.

The **Dynamic Range** test calculates the difference between the darkest and lightest gray levels in an image. The more levels of gray produced, the better.

The **Uniformity** test assesses the difference in gray levels among the left, middle, and right parts of the scan. The uniformity test can indicate various problems, including poor lamp quality or mechanical misalignment. The software bundled with a scanner can correct uniformity problems.

The **Color Registration** test measures the vertical and horizontal distances among the red, blue, and green separations that make up an image. Each

colored CCD (charged-coupled device) should register the image at the exact same point. Problems of more than a fraction of a pixel can cause blurred images or inadequate colors on edges.

To time the **Color Photo** test, we scanned the 8- by 10-inch crayon photo using each scanner's bundled Twain driver and image-editing software when we could. In the case of the Microtek unit, the image editor Pagis SE masked the Twain driver and allowed only a maximum of 200 dpi. In this instance, we scanned directly through the Twain driver to be able to obtain a 300-dpi scan for comparison. We scanned the photo at 24-bit color and 300 dpi, with the exception of the Logitech PageScan Color Parallel, which does not offer a 300-dpi option and therefore was tested at 200 dpi. Similarly, for the **Black-and-White Text** test, we scanned the text document at 1 bit and at 300 dpi. For all speed tests, we initiated timing on the scan's start and finished when the image was completely loaded and mouse control was returned. We ran each test three times, and we report the average timing for each scanner.

For the **OCR Accuracy** test, we compiled a test deck of various types of documents, from standard business letters to magazine articles containing photos and graphics. The condition of the originals varied as well; some were brand-new and others were worn with age. To ensure an equitable evaluation, we scanned the test deck in 1 bit, black-and-white text mode at 300 dpi using each scanner's bundled software and ran each image through OmniPage Pro, Caere's OCR software. We considered an error to be any word that the scanner didn't reproduce faithfully. The percentage of OCR accuracy—the average amount of error-free text—each scanner achieved appears alongside our jury rankings in the sidebar "Comparing Scanner Output."

Special thanks to Yair Kipman and Daphna Kipman of KDY Associates (603-598-2500; [kdy@acut.com](mailto:kdy@acut.com); [www.imagemexpert.com](http://www.imagemexpert.com)), who performed the technical-quality tests.—*Analysis written by Diane Jecker and Ben Z. Gottesman*



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**SUMMARY OF FEATURES**

See **WWW**

# SOHO Scanners

**PC MAGAZINE**  
**EDITOR'S CHOICE**

|                                                       | <b>Avision<br/>AV100C</b> | <b>Eastman Kodak<br/>PhotoDoc<br/>Color Scanner</b>                                                                        | <b>Hewlett-Packard<br/>ScanJet 5s</b>      | <b>Logitech<br/>PageScan<br/>Color Parallel</b>     | <b>Microtek Color<br/>PageWiz</b>                                             | <b>Mitsubishi<br/>S600C</b>                        | <b>Proton ScanPro</b>                                                   | <b>Storm<br/>EasyPhoto<br/>SmartPage Pro</b>                   |
|-------------------------------------------------------|---------------------------|----------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|-----------------------------------------------------|-------------------------------------------------------------------------------|----------------------------------------------------|-------------------------------------------------------------------------|----------------------------------------------------------------|
| Street price                                          | \$200                     | \$250                                                                                                                      | \$200                                      | \$200                                               | \$160                                                                         | \$230                                              | \$200                                                                   | \$150                                                          |
| Bundled software                                      | PaperPort 5.1             | Kai's Power G00,<br>Kodak Digital<br>Science<br>Launcher, Kodak<br>Picture Postcard,<br>Microsoft Picture<br>It!, OmniPage | PaperPort 4.0,<br>OmniPage                 | PaperMaster,<br>Adobe<br>PhotoDeluxe,<br>TextBridge | Pagis Pro 97,<br>iPhoto Express<br>1.0, iPhoto Plus,<br>TextBridge<br>Classic | Presto!<br>PageManager,<br>TextBridge              | Presto!<br>PageManager LE,<br>Presto!<br>PageImage,<br>Presto! PageType | PaperMaster,<br>Adobe<br>PhotoDeluxe,<br>TextBridge<br>Classic |
| Engine manufacturer                                   | Avision                   | Info not available                                                                                                         | Info not available                         | Logitech                                            | Microtek                                                                      | Avision                                            | Canon                                                                   | Storm                                                          |
| Dimensions (HWD, in inches)                           | 4.2 x 11.5 x 3.5          | 7.3 x 11.5 x 6.0                                                                                                           | 4.4 x 12.4 x 6.8                           | 4.7 x 12.8 x 4.1                                    | 4.8 x 10.3 x 5.0                                                              | 4.0 x 11.5 x 4.2                                   | 3.5 x 12.9 x 3.1                                                        | 3.5 x 11.5 x 5.5                                               |
| Weight (pounds)                                       | 3.5                       | 4.0                                                                                                                        | 3.8                                        | 4.2                                                 | 3.3                                                                           | 3.5                                                | 3.3                                                                     | 3.3                                                            |
| Operating systems supported                           | Windows 95                | Windows 95                                                                                                                 | Windows 3.1 or<br>later, Windows<br>NT 4.0 | Windows 95                                          | Windows 95,<br>Windows NT 4.0,<br>Mac OS                                      | Windows 3.1 or<br>later, Windows<br>NT 4.0, Mac OS | Windows 3.1 or<br>later                                                 | Windows 3.1 or<br>later                                        |
| <b>Scan Area</b>                                      |                           |                                                                                                                            |                                            |                                                     |                                                                               |                                                    |                                                                         |                                                                |
| Paper sensor/Skew correction                          | ■ ■                       | ■ ■                                                                                                                        | ■ ■                                        | ■ ■                                                 | ■ ■                                                                           | ■ ■                                                | ■ ■                                                                     | ■ ■                                                            |
| Maximum optical resolution (dpi)                      | 300 x 600                 | 300 x 300                                                                                                                  | 300                                        | 200 x 400                                           | 300 x 600                                                                     | 300 x 600                                          | 300 x 600                                                               | 300 x 600                                                      |
| Maximum interpolated resolution (dpi)                 | 4,800 x 4,800             | 1,200 x 1,200                                                                                                              | 600                                        | 1,600 x 1,600                                       | 1,200 x 1,200                                                                 | 2,400 x 2,400                                      | 1,200 x 1,200                                                           | 5,000 x 5,000                                                  |
| Minimum/maximum height (inches)                       | 2 / 14                    | 2 / 14                                                                                                                     | 3 / 30                                     | Unlimited /<br>unlimited                            | Unlimited / 14                                                                | 2 / 14                                             | 1.4 / Unlimited                                                         | 2 / 14                                                         |
| Minimum/maximum width (inches)                        | 3.5 / 8.5                 | 3.5 / 8.5                                                                                                                  | 2 / 8.5                                    | 1 / 8.5                                             | Unlimited / 8.5                                                               | 3.5 / 8.5                                          | 1.5 / 8.5                                                               | 1.5 / 8.7                                                      |
| Minimum/maximum paper weight (pounds)                 | 12 / 24                   | 16 / 24                                                                                                                    | 16 / 28                                    | Unlimited* /<br>unlimited*                          | 20 / 80                                                                       | 5 / 100                                            | 16 / 120                                                                | Unlimited* /<br>unlimited*                                     |
| Maximum number of sheets user can load at<br>one time | 10                        | 10                                                                                                                         | 10                                         | 10                                                  | 1                                                                             | 10                                                 | 1                                                                       | 1                                                              |
| Detachable for hand scanning                          | ■                         | ■                                                                                                                          | ■                                          | ■                                                   | ■                                                                             | ■                                                  | ■                                                                       | ■                                                              |
| Color image type                                      | 24-bit                    | 24-bit                                                                                                                     | 24-bit                                     | 24-bit                                              | 24-bit                                                                        | 24-bit                                             | 24-bit                                                                  | 30-bit                                                         |
| Crop/rotate/invert filter                             | ■ ■ ■                     | ■ ■ ■                                                                                                                      | ■ ■ ■                                      | ■ ■ ■                                               | ■ ■ ■                                                                         | ■ ■ ■                                              | ■ ■ ■                                                                   | ■ ■ ■                                                          |
| Blur/sharpen filter                                   | ■ ■                       | ■ ■                                                                                                                        | ■ ■                                        | ■ ■                                                 | ■ ■                                                                           | ■ ■                                                | ■ ■                                                                     | ■ ■                                                            |
| Edge-enhancement filter                               | ■                         | ■                                                                                                                          | ■                                          | ■                                                   | ■                                                                             | ■                                                  | ■                                                                       | ■                                                              |
| RGB-to-CMYK conversion                                | ■                         | ■                                                                                                                          | ■                                          | ■                                                   | ■                                                                             | ■                                                  | ■                                                                       | ■                                                              |
| <b>Interface</b>                                      |                           |                                                                                                                            |                                            |                                                     |                                                                               |                                                    |                                                                         |                                                                |
| SCSI interface                                        | ■                         | ■                                                                                                                          | ■                                          | ■                                                   | ■                                                                             | ■                                                  | ■                                                                       | ■                                                              |
| Type of parallel-port adapter                         | None                      | EPP                                                                                                                        | Twain                                      | EPP                                                 | EPP                                                                           | None                                               | EPP                                                                     | EPP                                                            |
| Proprietary interface                                 | ■                         | ■                                                                                                                          | ■                                          | ■                                                   | ■                                                                             | ■                                                  | ■                                                                       | ■                                                              |
| Parallel-port/Serial port/Proprietary card            | ■ ■ ■                     | ■ ■ ■                                                                                                                      | ■ ■ ■                                      | ■ ■ ■                                               | ■ ■ ■                                                                         | N/A                                                | ■ ■ ■                                                                   | ■ ■ ■                                                          |
| Twain-/ISIS-compatible                                | ■ ■                       | ■ ■                                                                                                                        | ■ ■                                        | ■ ■                                                 | ■ ■                                                                           | ■ ■                                                | ■ ■                                                                     | ■ ■                                                            |
| Warranty                                              | 1 year                    | 1 year                                                                                                                     | 1 year                                     | 1 year                                              | 1 year                                                                        | 1 year                                             | 1 year                                                                  | 1 year                                                         |

N/A—Not applicable: The product does not have this feature. \* In hand-held mode.

product that produces acceptable and reliable if not great color. Once its operability glitches are resolved, the PageWiz could be a strong contender.—*DAH*

**Color PageWiz.** Street price: \$160. Microtek Lab Inc., Redondo Beach, CA; 800-654-4160, 310-297-5000; fax, 310-297-5050; [www.microtekusa.com](http://www.microtekusa.com). *Circle 454 on reader service card.*

## Mitsubishi S600C

Despite its rather impressive output quality, the Mitsubishi S600C (\$230 street) comes with some rough edges in operability that keep it from the top tier.

Like the Avision AV100C, the S600C uses the a SCSI-2 interface instead of the more common parallel connection. The

S600C supports SCSI-2, but the cable that came with the unit had a Centronics SCSI-1 connector at the PC end, so we had to supply our own connector to attach it to the SCSI-2 host adapter. We also had problems exporting TIFF files from the Twain driver.

The S600C does not offer any jam protection, and we experienced trouble during testing with the document-imaging software, NewSoft's Presto! Page Manager. It crashed repeatedly when we tried to save a particular color text document as a TIFF file. The S600C's scant documentation doesn't help; Mitsubishi attributes the crashes to bugs found in Presto! and suggests moving and saving such images to an application like PhotoShop.

Bugs aside, S600C's times were in the higher half of the scanners in this roundup. On our technical-quality tests, the unit performed well and did not produce any of the glaring inaccuracies found in some of the other scanners. It produced the best results on our jury tests, with good reproduction, clarity, and no streaking.

The S600C comes with MicroFrontier's ColorIt, Newsoft's Presto!, and Xerox's TextBridge Classic. Presto! comes with Page Manager and Page-Filer; the one you use will depend on which interface you prefer and the tasks you need to perform.

Mitsubishi's contribution to the sheet-fed color scanner market is a stur-



## HARDWARE

### SOHO Scanners

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| Tamarack<br>DocuMan 1200C          | UMAX<br>PageOffice IIC                        | Visioneer<br>PaperPort Strobe                                                                          |
|------------------------------------|-----------------------------------------------|--------------------------------------------------------------------------------------------------------|
| \$130                              | \$200                                         | \$230                                                                                                  |
| Tamarack<br>DocuMan,<br>TextBridge | Presto! Page<br>Manager, Adobe<br>PhotoDeluxe | PaperPort 5.0,<br>Connectix<br>QuickCards,<br>CardScan,<br>Expensable,<br>PhotoEnhancer,<br>TextBridge |
| Tamarack                           | UMAX                                          | Visioneer                                                                                              |
| 3.2 x 12.7 x 2.3                   | 4.1 x 14.1 x 4.5                              | 2.0 x 11.2 x 2.9                                                                                       |
| 2.2                                | 2.6                                           | 1.4                                                                                                    |
| Windows 3.1 or<br>later            | Windows 3.1 or<br>later                       | Windows 95,<br>Mac OS                                                                                  |
| 300 x 600                          | 300 x 600                                     | 300 x 600                                                                                              |
| 1,200 x 1,200                      | 4,800 x 4,800                                 | 2,400 x 2,400                                                                                          |
| 2.2 / 19                           | 2 / 14                                        | 2 / 30                                                                                                 |
| 15 / 8.5                           | 2 / 8.5                                       | 2 / 8.5                                                                                                |
| 20 / 25                            | Unlimited* /<br>unlimited*                    | Info not available                                                                                     |
| 1                                  | 1                                             | 1                                                                                                      |
| 24-bit                             | 24-bit                                        | 24-bit                                                                                                 |
| None                               | EPP                                           | EPP                                                                                                    |
| 1 year                             | 1 year                                        | 1 year                                                                                                 |

dy unit with a fast SCSI-2 interface. But it lacks a refined software bundle, complete documentation, and a reliable Twain driver—factors that unfortunately detract from the S600C's good output quality.—SP

**Mitsubishi S600C.** Street price: \$230. Mitsubishi Chemical, Sunnyvale, CA; 800-347-5724, 408-773-2836; fax, 408-481-9488; [www.mitsubishi-infostorage.com](http://www.mitsubishi-infostorage.com). Circle 455 on reader service card.

### Proton ScanPro

With a proprietary ISA parallel-interface card that connects between the scanner and the PC, the Proton ScanPro (\$200 street) is the odd man out in this roundup. This dubious distinction doesn't help the

ScanPro's performance: It is also difficult to use, and its output is acceptable at best.

The ScanPro's Twain dialog is confusing, with all the settings hidden deep in the dialog boxes. In addition, the scanner uses a contact image sensor (CIS), a device that runs the length of the scan head that Proton Corp. designed to deliver better-quality images. We found the CIS unreliable. For example, when we repeatedly scanned two 5-by-7-inch glossy photographs, they both slipped on the roller and never made it all the way through the scanner. Our jury tests put the ScanPro, which produced very streaky images, in the lower half of the rankings, and its technical quality was average. The scanner's sole strength is its reasonably speedy performance.

The ScanPro comes bundled with NewSoft's Page Manager 2.0, PageImage, WordLinux, and PageType. Without any paper documentation or a copy of Adobe Acrobat to read the .PDF-formatted electronic documentation, these tools are not very easy to use and do not integrate well with the ScanPro.

All in all, the ScanPro needs some improvements to compete in this field. Its satisfactory results on our performance tests are outweighed by its unimpressive output quality and clumsy operability.—DAH

**ScanPro.** Street price: \$200. Proton Corp., Los Cerritos, CA; 562-404-2222; fax, 562-404-4322; [www.proton-usa.com](http://www.proton-usa.com). Circle 457 on reader service card.

### Storm EasyPhoto SmartPage Pro

Once a specialist in small-format photo scanners, Storm Technology has introduced a sheet-fed color scanner called the EasyPhoto SmartPage Pro (\$150 street). This new product makes some strides in attempting to straddle both the home and business markets but still fell short on some of our tests, as well as in hand scanning and high resolution.

The detachable SmartPage Pro consists of a nearly cylindrical scan head attached to a feeder base that passes pages from front to back at a slight, downward angle. But the scanner is not self-propelled unlike the Logitech PageScan Parallel and the UMAX PageOffice IIC: In-

stead, you must slowly move the unit yourself, like a traditional hand scanner. It was nearly impossible to scan a page of text manually without skewing the image.

The SmartPage Pro's color registration was very good on our technical-quality tests; however, interpolated scans above 300 dpi regularly caused DocuMagix's PaperMaster SEC—the document-imaging software bundled with the scanner—to crash. The unit's magnification ratio and black level were poor, although its reproduction accuracy was rather good on our jury tests. The SmartPage Pro also had the slowest black-and-white text time.

Besides the adequate PaperMaster software, the scanner bundles its own EasyPhoto software for a user-friendly way to manage photos, Adobe PhotoDeluxe for image editing, and Xerox's TextBridge Classic for OCR. For just basic document management and heavy-duty photo scanning, the SmartPage Pro provides a decent solution. But if you do a lot of hand scanning and need satisfying high resolution, you would be better off looking elsewhere for a faster and more reliable scanner.—SP

**EasyPhoto SmartPage Pro.** Street price: \$150. Storm Technology Inc., Mountain View, CA; 888-438-3279, 650-691-6600; fax, 650-691-9825; [www.easypphoto.com](http://www.easypphoto.com). Circle 458 on reader service card.

### Tamarack DocuMan 1200C

The least expensive scanner in this roundup, the DocuMan 1200C (\$130 street) from Tamarack Technologies is also one of the least capable scanning solutions. Despite average performance and satisfactory output, the DocuMan's weak documentation, poor proprietary software, and unreliable operability overshadow its stronger points.

A single CD, which contains DocuMan's software and Twain driver, and a patch disk must be installed separately. There is only very basic documentation and little online help, and the Twain driver has no automated features.

The DocuMan's slim horizontal structure resembles the Visioneer PaperPort Strobe. But unlike the Strobe, the DocuMan uses a fixed front-to-top paper path, which tended to curve pages and photos



## Smile, Click, and Scan

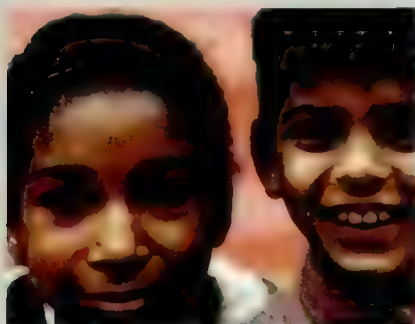
A couple years ago, photo scanners filled a void that sheet-fed scanners left open: the need to scan color photos into your PC. Sheet-fed scanners now handle color, often with better resolutions, but you still might want to consider a photo scanner if you are new to scanning and primarily want to scan small photos, don't have much desk space, and have a tight budget.

We evaluated three photo scanners: the **PhotoPlus** (\$200 street) from Epson (800-463-7766, [www.epson.com](http://www.epson.com)), the **Snapshot Photo Scanner** (\$200 street) from Kodak (888-375-6325, [www.kodak.com](http://www.kodak.com)), and the **ScanRom Photo** (\$90 street) from Artec (510-440-1200, [www.artecusa.com](http://www.artecusa.com)). All are rather small; the widest photo scanner we look at here accepts a 4.1-inch-wide sample, while the sheet-fed scanners we tested typically accommodate input up to 8.5 inches wide. So a photo scanner unfortunately can't handle anything much bigger than a 4-by-6-picture. But if cost is an issue, note that the price of these photo scanners runs a little less than sheet-fed; Kodak, for example, sells its Snapshot for \$200 and its sheet-fed PhotoDoc for \$250 (street).

Epson offers the best combination of image quality and well-balanced software, including Sierra PrintArtist and Corex CardScan SE. PhotoPlus's scanned images showed detail well and reproduced the brightness of our originals accurately. At 400 dpi, Artec's ScanRom Photo offered the highest true optical resolution on our sample (interpolated to 4,800 dpi), but its images tended to be dark and its image-capture software does not include controls for brightening them. Although Kodak's Snapshot was easy to use, its 133-dpi true resolution was the lowest among the three units and produced somewhat faint and washed-out images.

On the high end, Hewlett-Packard (800-752-0900, [www.hp.com](http://www.hp.com)) has released PhotoSmart (\$500 street), which comes with the ability to scan negatives and slides as well as software that lets you correct exposures.

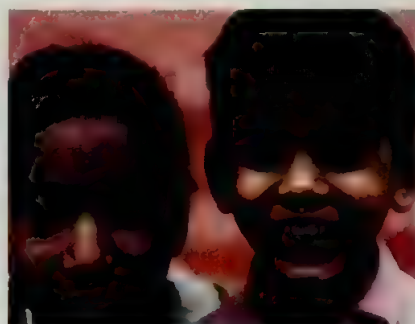
If you scan only small photos and want something small and cheap, one of the three photo scanners we examined may meet your needs. But a sheet-fed scanner can now give you far more utility and flexibility for just a little more money.—Bill Dyszel



The PhotoPlus, from Epson, produced the best color output to the naked eye.



The output from Kodak's Snapshot generated somewhat washed-out images.



The ScanRom Photo, from Artec, tended to produce darker images.

during testing. The DocuMan lacks paper jam protection and failed to detect jams, forcing us to tilt the cover open to remove the damaged paper. The scanner consistently skewed our glossy test photos and occasionally produced skewed images of our matte photos, even though we fed them properly.

The DocuMan scored in the middle of the pack on all of our performance tests. It fared better on our technical-quality tests, with several strong individual measurements, quite satisfactory black and contrast levels, and consistently good color registration. It neared the bottom on our jury tests, which judge reproduction accuracy.

Though the DocuMan 1200C offers an enticing price, it doesn't deliver the same

level of value as its competitors. Its good technical quality ultimately can't compensate for weak software, scant documentation, and frequent jams.—SP

**DocuMan 1200C.** Street price: \$130. Tamarack Technologies Inc., Orange, CA; 714-744-3979; fax, 714-744-4582; [www.tamarack.net](http://www.tamarack.net). Circle 459 on reader service card.

### UMAX PageOffice IIC

A detachable, self-propelled scanner, the PageOffice IIC (\$200 street) from UMAX Technologies can walk across your bound or large documents. But unlike its predecessor, which won our Editors' Choice two years ago, the PageOffice IIC's bulky stature and poor test results keep it from securing a top spot

in this roundup.

The PageOffice IIC simply sits on top of the feeder base, which pulls pages horizontally from the front and ejects them at about a 60-degree incline from the rear. The left paper guide is fixed, and the right is adjustable; this sometimes causes the document to feed unevenly. (In fact, our test magazine article slipped sideways.)

To scan a bound document, you simply lift the scanner from the base and set it on top of the document. The unit rolls across documents reliably, but its bulky size makes scanning near bindings difficult. We found the scanner's roaming capability more suitable for scanning sections of large documents that cannot fit in the feeder.

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## Sheet-Feds and Flatbeds Go Head to Head

**N**ow that sheet-fed scanners offer color, we decided to see how they stacked up against similarly priced flatbed scanners. We examined the UMAX Astra 300P from UMAX Technologies, which has discontinued its Vista 1200 flatbed, our Editors' Choice in the issue of March 4, 1997.

The new, competitively priced UMAX Astra 300P (\$180 street) is 12 inches wide by 16 inches deep. When you consider some of the sheet-fed scanners that feed either from the front or from the rear, you may find that some sheet-feds' desk real estate isn't much less than that taken by this UMAX Astra.

The newest sheet-fed scanners range from a highest optical resolution of 300 dpi to an interpolated resolution of 5,000 dpi. This rivals their flatbed sisters: The Astra 300P has a maximum optical resolution of 300 dpi with an interpolated resolution of 4,800. Among the sheet-fed pack, this unit tied for second on our jury tests (after the Mitsubishi S600C); it had an OCR accuracy of 98.03 percent and decent technical quality.



The Mitsubishi S600C's output (left) is slightly better than that of the UMAX Astra 300P (right).

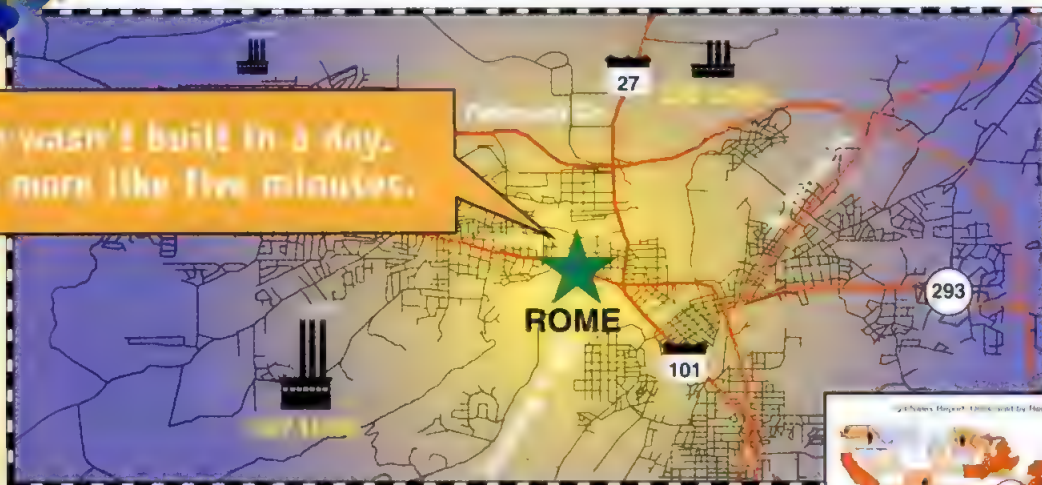
Keep in mind that the drawbacks possible with a sheet-fed scanner—wrinkled or skewed images and jams—are the exception, not the rule. And without auto-feed attachments, you need more time to place images on a flatbed.

So if you have a budget of \$300 or less and primarily scan text documents for OCR or archiving, a sheet-fed scanner may suit your needs. If you scan a variety of text documents and images, you might prefer a flatbed scanner, especially one of the newer, less expensive models.—*Diane Jecker*

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**HARDWARE**  
*SOHO Scanners*

The PageOffice IIC performance test results ranged from slow to average, its technical quality was inconsistent, and our jury test results put the scanner third to last. Its bundled software includes Adobe PhotoDeluxe, which offers basic image transformation features, and NewSoft's Presto! Page Manager, an adequate document-imaging package.

All told, PageOffice's unimpressive performance and quality, as well as its bulky design, ultimately keep it from fulfilling its potential.—*SP*

**PageOffice IIC.** Street price: \$200. UMAX Technologies Inc., Fremont, CA; 800-562-0311, 510-651-4000; fax, 510-651-8834; [www.umax.com](http://www.umax.com). *Circle 460 on reader service card.*

### **Visioneer PaperPort Strobe**

The PaperPort Strobe (\$230 street), Visioneer's latest attempt to offer a complete sheet-fed scanning solution, is almost a success. With fast text scanning and impressive document-imaging software, the Strobe makes its mark, but its slow and faulty color reproduction

leaves room for improvement.

The Strobe offers an adjustable paper path and is the only scanner in this roundup that senses and automatically feeds documents through the path. An easy-to-use installation program, great interactive online help, and separate hardware and software manuals make installation a snap.

The Strobe's bundled software, PaperPort 5.0 (also from Visioneer), came up automatically when we inserted a page, and its automatic skew detection reliably rejected any attempts to jam the paper, even when the unit was speeding through text-only documents. Its 9-second time for scanning our black-and-white text test document was by far the fastest, but its color time (5 minutes 31 seconds) was the second-slowest.

Our technical-quality measurements also yielded broad results. The unit's black level and contrast were excellent, yet the gray levels varied from the left side of the unit to the middle, and its magnification ratio was rather poor. On our jury tests, the Strobe's streaky color

reproduction placed it at the very bottom of the scanner pack.

Despite these mixed results, the Strobe effectively integrates into PaperPort 5.0 as an excellent home base for all scanning and document image management tasks. The PaperPort Desktop displays thumbnails of your scans and lets you organize them by folder. The customizable Link Bar lets you scan fax, printer, and OCR applications, and it accepts icons for your own applications. The Strobe comes with four third-party applications: Connectix QuickCards SE, Corex CardScan SE, PictureWorks PhotoEnhancer, and Quicken ExpensAble SE. No other scanner in this roundup offers all these.

The Visioneer PaperPort Strobe is almost a hit. It has superb hardware design, solid operability, and intuitive software but still needs some improvements in performance and in the quality of its color output.—*SP*

**PaperPort Strobe.** Street price: \$230. Visioneer Inc., Fremont, CA; 800-787-7007, 510-608-0300; [www.visioneer.com](http://www.visioneer.com). *Circle 461 on reader service card.* **PC**

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| Eizo-Nano TX-C7S            | 0.25                 | 73                           | 30-92        | 1125      |
| Nokia 447Xi                 | 0.25                 | n/a                          | 31-92        | 899       |
| Sony 17seil                 | 0.25                 | 60                           | 30-85        | 899       |
| <b>21"</b> TeleVideo SVP350 | 0.28                 | 85                           | 30-107       | 1649      |
| Mitsubishi 91TXM            | 0.28                 | 75                           | 30-95        | 1649      |
| NEC P1150                   | 0.28                 | 75                           | 31-94        | 1599      |
| Iiyama Pro 21               | 0.30                 | 75                           | 30-94        | 1699      |

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CIRCLE 149 ON READER SERVICE CARD

# Net Tools



## Talkin' About T1

*Small routers for remote-site connectivity are being pushed to the fore by the increased availability and affordability of T1 lines.*

By Les Freed

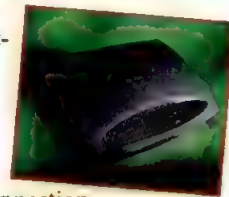
The rush to build corporate intranets and connect to the Internet has spurred a wave of interest in small routers. But as network traffic needs grow, many companies find that their ISDN routers just can't handle the traffic anymore. A new breed of inexpensive, T1-capable routers—coupled with the wider availability and lower cost of leased T1 lines—provide a fast, relatively inexpensive way to knit your company's remote offices into a cohesive wide area network.

For this roundup, we tested five entry-level, T1-

capable routers—Ascend Communications' Pipeline 130 T1, Bay Networks' BayStack Access Node, Cisco Systems' Cisco 1601, Digital Equipment Corp.'s RouteAbout Access E1, and 3Com Corp.'s OfficeConnect NETBuilder 141U. Five years ago, remote-site routers like these started at around \$5,000. Today, \$2,000 buys you a far better router with more features, better usability, and higher reliability. These routers are also very easy to configure. In fact, four of the five are configured and managed using Windows-based graphical interfaces, as opposed to the old command line ap-

## INSIDE

**T1 ROUTERS** Providing connections to remote sites—be it your home office or the Internet—is a theme to which we've all grown accustomed. But the message has shifted from merely providing the connection to providing the fastest connection possible. Contributing editor Les Freed takes a look at five T1 routers that can offer you the speed you crave.



**NETWORK ANALYZERS** If you've been around networking for a while, you probably know what packet sniffers are. But these network detectives haven't come cheap, until now. Contributing editor Steve Rigney tested network analyzers from Triticom and Network Instruments that make troubleshooting your network affordable. *Page 281*

**REMOTE ACCESS** Though the built-in remote-access capabilities of Windows NT have undeniable appeal, the lack of user management may put a dent in your excitement. Technical analyst Kevin Young takes a look at a product from Virtual Motion that comes to the rescue—Remote Access Manager. *Page 285*

## INTERNET TOOLS

We're joined again by contributing editor Tony Pompili as he explains how to tackle remote- and small-office routing. *Page 291*



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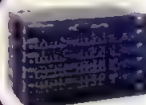
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# Net Tools

T1 ROUTERS

proach (see "Router User Interfaces" below).

In most cases, the product comes with a V.35 serial interface for connecting the router to a CSU/DSU interface to the T1 line. Ascend offers a model with a built-in CSU/DSU, which can save you the \$500 to \$700 you would otherwise have to spend on the unit. Each of the products also has an ISDN BRI interface that can be used as the primary or backup link, as well as support for frame-relay and fast serial connections.

The two most common applications for these routers are branch-office access to the main office's LAN and Internet access. For Internet access, you need only TCP/IP routing, but remote LAN access may require IPX or AppleTalk routing as well. All the routers we tested come with IP routing software, and some also offer a full suite of protocol routing as an optional, field-installable upgrade. Cisco solves the IPX problem by providing an IP-to-IPX gateway with the Cisco 1601 router.

All of our test products can also bridge nonrouted protocols across the WAN link. While not as technically sophisticated as routing, bridging is a viable way to move moderate amounts of IPX or AppleTalk traffic across a WAN link.

In terms of security, all these routers support the standard packet filtering that often

serves as a security starting point. But Ascend offers a beefier option as well. Ascend's Secure Access Firewall and encryption software upgrade for its Pipeline 130 T1 is available for \$1,000 (for details, see "Security Solidarity," Network Edition, October 7, 1997).

To test these routers, we ran timed FTP tests, and we tested each vendor's product in pairs, except for the 3Com router (for more information, see our Web site, [www.pcmag.com](http://www.pcmag.com)). 3Com's Boundary Routing technology, used in the model we saw, requires a 3Com central site router at the host site, which 3Com provided. Though the Cisco 1601 was the top performer on our tests, the degree of difference among the products was slim.

## LEASE OR DIAL?

One issue you may be concerned about when purchasing a new router is whether and when you should migrate from ISDN to a T1 line (see the sidebar "T1: Another Port in the Wall") or frame-relay service. Several factors come into play, such as the number of users at your site, local phone company tariffs, and the physical distance between your offices and the home office.

ISDN is not without its charms. With data compression, ISDN provides up to 512 Kbps of throughput. And because ISDN calls

connect very quickly, your users may never know they're using a dial-up link. But ISDN can be expensive, especially in markets where the local phone company bills ISDN calls by the minute. So when the number of users begins to grow, causing the cost of ISDN to creep upwards, you may want to consider a higher-speed option.

In addition to supporting ISDN, all the products we review provide a seamless migration path to faster-speed connections. And you don't have to sacrifice your ISDN altogether. You can configure any of the products in our roundup so that the ISDN line can serve as a backup when the other connection gets overloaded or goes down. In addition, most products can also use the two links (T1 and ISDN) to route to two separate locations.

## WRESTLING WITH IP

Many legacy LANs began life as IPX-only installations. Adding Internet or corporate intranet access means installing IP on every client PC. This can be a time-consuming ven-

## MANAGEMENT INTERFACES

### Router User Interfaces

Over the past few years, we've reviewed leased-line and ISDN routers many times. Each year, the routers become a little more powerful, a little less expensive, and a little harder to configure. During our testing, however, we were pleasantly surprised to see that except for the 3Com router, all the products in our test group offered Windows-based configuration programs to help ease the installation process.

Because routers don't have their own screen displays and keyboards, a router has to be configured and managed by some kind of external device, usually an ASCII terminal attached to the router's administration port. To configure the router, you connect it to a terminal or a computer running a terminal emulator program and enter commands—line by line—into the router's command processor.

The number of commands necessary to configure a router completely varies from vendor to vendor, but 20 is probably the ab-

solute minimum. All the products in our roundup provide command line interfaces, and all of them use their own unique command languages.

Command line interfaces are fine if you're fluent in the command language being used, and if you use it often enough to stay fluent. But if you don't, configuring a router can be a time-consuming and frustrating venture.

A few years back, Ascend Communications took a bold first step toward making routers easier to deal with. The company created a simple, text-based, windowed display using standard VT-100 terminal codes. The beauty of Ascend's system is that it allows you to view or change any router setting without having to memorize Ascend's command language. The downside is that the menu system makes it all too easy to mess with something you shouldn't have touched.

In the last few months, all the manufac-

turers in our test group have released or have been developing Windows-based graphical configuration software to make installing and maintaining routers easier. Ascend, Bay, Cisco, and Digital provided us with Windows-based configuration software, and 3Com plans to port its network management software Transcend to its routers in the next few months.

Of the group, Cisco's ConfigMaker program stands out. ConfigMaker uses a drag-and-drop metaphor that lets you create a visual diagram of your entire WAN. Once you've created the diagram, ConfigMaker sends the proper configuration commands to each router on the network. ConfigMaker supports all Cisco routers from the 1000 series up. Cisco's SOHO routers, in the 700 series, come with their own, simplified GUI installation program.

Ascend's Java-based Pipeline Configurator (JBPC) deserves mention. Though not all the capabilities of the JBPC were ready in time for our review, Ascend is working on an updated version of the software that should be ready by the time you read this. Existing Pipeline users can download the free software from Ascend's Web site ([www.ascend.com](http://www.ascend.com)).



ture, since each PC requires a unique, registered IP address. To help tame the IP dragon, both Ascend and Cisco products support the Network Address Translation (NAT) protocol and include Dynamic Host Configuration Protocol (DHCP) servers.

NAT is an address-spoofing protocol that uses a single IP address (like the dynamic address you're assigned when you dial into an ISP) to connect an entire LAN to the Internet. The NAT protocol running in the router intercepts Internet-bound LAN traffic and reassigns the dynamic IP address to that traffic. The result: You don't need an official, registered IP address for each client.

A DHCP server assigns client IP addresses on the fly. When a new client starts up, it obtains its IP address from the DHCP server. This eliminates the need to assign each client PC its own IP address.

But the Cisco 1601 goes a step farther by eliminating the need for IP altogether. The included IP-to-IPX gateway allows IPX-connected workstations to access the Internet. To use the IPX gateway, you install a special, Cisco-provided Winsock.dll file on each IPX client. The Cisco IPX software provides normal Winsock IP functions on the client PC, but it communicates with the router via IPX.

In case you're considering making the jump to leased lines or it's your first time purchasing a router, all of the products give you flexibility and options for providing several ranges of connectivity. Performance wasn't the big differentiator among the products, so you need to look carefully at which features and services you need when deciding on the product that's right for your organization.

## Ascend Pipeline 130 T1

ALL REVIEWS BY LES FREED

Breaking new ground in small T1 routers, Ascend Communications' \$1,995 Pipeline 130 T1 is the only product in our roundup that includes an integral T1 Customer Service Unit (CSU)—the demarcation point between the phone company's equipment and the router—which can save you as much as \$700. It's also the only product in our roundup that offers an optional application-level firewall (Secure Access Firewall, \$1,000, reviewed in the Network Edition, October 7, 1997).

Like the Cisco 1601, the Pipeline comes with support for the Network Address Translation (NAT) protocol and a Dynamic Host Configuration Protocol (DHCP) server. Like most products in this roundup, the Pipeline can route ISDN and T1 links to separate locations. In addition, you can configure the Pipeline to bring up the ISDN link as a backup line, as you can with all of these products.

## EDITORS' CHOICE

### • Cisco 1601



*All the products in our roundup have mastered the routing*

basics for both remote-site and Internet connectivity. And they've all progressed exponentially in terms of ease of configuration and management. But for real ease of use, a solid feature set, and strong options for dealing with IP on your network, the Cisco 1601 rises to the top.

With its graphical ClickStart setup utility and ConfigMaker software for managing and configuring various routers, the Cisco 1601 has made setting up a router approachable and straightforward. Formerly, you had to know a command line language—in Cisco's case, IOS—to get your router going, but this is no longer the case. All the products (except for 3Com's) currently provide Windows-based management and configuration utilities, eliminating the need for command line know-how, but Cisco's offerings truly stand out.

Another advantage of the Cisco 1601 is that it will not only let you configure the

ISDN line as a backup—as all the products do—but also lets you route your T1 and ISDN lines to separate locations, a feature that was offered only by this unit and the Ascend Pipeline 130 among the routers we tested.

For handling IP on your network, Cisco has provided some extremely useful tools. To eliminate the hassle of installing IP on clients in an IPX network, Cisco provides an IP-to-IPX gateway with its router, the only product in our roundup to include this feature. In addition, the Cisco 1601, like the Pipeline 130, supports Network Address Translation (NAT) and comes with a built-in Dynamic Host Configuration Protocol (DHCP) server.

Other products we reviewed for this roundup had distinct strengths as well. In addition to providing both DHCP and NAT support, the Ascend Pipeline 130 T1 gives you the option of installing a true firewall on your router, the Secure Access Firewall (\$1,000), which we tested in our feature "Security Solidarity" (Network Edition, October 7, 1997). Bay Networks' BayStack Access Node and Digital's RouteAbout Access EI both provide an extremely handy bandwidth management feature. And 3Com's OfficeConnect NETBuilder 141U offers an alternative approach with its powerful Boundary Routing technology.

As for what it can handle, the Pipeline routes IP and IPX and acts as a bridge for all other Ethernet protocols. WAN protocols supported include PPP and Multilink PPP, as well as Ascend's MP+ and frame relay.

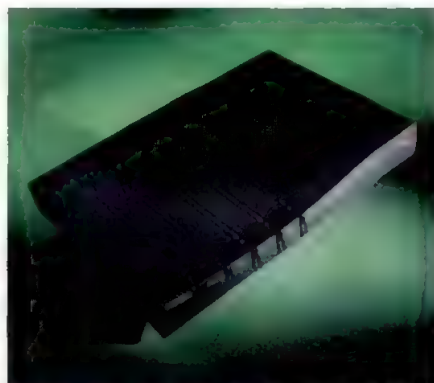
Housed in a modem-size black plastic box and smaller than many external CSU units, the Pipeline has all its connectors on the rear panel and five indicator LEDs on the front. The rear panel has AUI and 10Base-T Ether-

net connectors but lacks a link LED for the 10Base-T port.

Some of the products in the Pipeline family come with Ascend's new Java-based Pipeline Configurator (JBPC) software. Despite the unimaginative name, JBPC is an elegant, functional Java program that lets you install and configure the Pipeline without ever touching the router's built-in menu system. JBPC begins by locating any and all Pipeline routers attached to your local LAN, even if a given Pipeline's IP address hasn't been configured. Once you locate and select the new router, JBPC guides you through the configuration process.

The current version of JBPC provided for our review didn't support the Pipeline 130 T1, but with the help of Ascend's tech support we were able to use it to configure everything but the DHCP server, the NAT feature, and the T1 port. Ascend is working to integrate support for the Pipeline 130 T1 into JBPC, and it should be available by the time you read this.

Like all Ascend routers, the Pipeline contains Ascend's excellent built-in menu and monitoring software. To use the built-in



**COMING DOWN THE PIPE:** The Pipeline 130 T1 is the only router in this roundup with a T1 CSU.



menu, you attach a VT-100-compatible terminal or a PC with terminal software to the Pipeline's serial port. The menu system provides a detailed view of the Pipeline's current status, as well as statistics on LAN and WAN traffic. The menu system also lets you examine and configure every detail of the Pipeline's operation. Once you've configured the router's IP address, you can access the router menu from any telnet program.

**Pipeline 130 T1.** List price: \$1,995. Ascend Communications, Alameda, CA; 800-681-9578; fax, 510-747-2300; [www.ascend.com](http://www.ascend.com). Circle 954 on reader service card.

## BayStack Access Node

If you rate flexibility and expandability high on your list, you'll like Bay Networks' \$2,895 BayStack Access Node router. The BayStack's dual serial ports (which can be configured to support V.35, RS-232, and RS-449/422 serial protocols at T1 and fractional T1 speeds), a standard ISDN BRI interface (which can be used as a primary, backup, or overflow data channel), and an optional third serial port or second Ethernet interface provide loads of flexibility and plenty of room for expansion.

Like Digital's Route>About Access EI, the BayStack also offers traffic prioritization across a wide area network. You can assign one of three possible priority levels to LAN traffic—low, normal, or high—based on protocol type, source or destination address, or packet type. This lets you ensure that mission-critical data will take priority over Web browsing or the downloading of unauthorized software and e-mail.



**TRUE-BLUE ROUTING:** The BayStack Access Node routes IBM's SNA mainframe protocol.

unit's serial interfaces to support the IBM Synchronous Data Link Control (SDLC) protocol, so that the BayStack can carry IBM SNA mainframe terminal traffic over the same WAN link that it uses to carry IP and IPX traffic.

Two of the BayStack's standout features are its configuration software, the Windows-based Quick2Config, and its exemplary documentation. In addition to the excellent, easy-to-follow printed manuals, the documentation includes three CD-ROMs containing the router firmware and electronic copies of the manuals. The combination of the documentation and Quick2Config let us easily configure our test unit. We had the BayStack up and running in just a few minutes.

To get you started, Quick2Config displays a logical view of each of the Baystack's Ethernet, ISDN, and serial ports. To configure the router, you simply add protocols and assign addresses to the proper interfaces. The changes in configuration take place immediately, and the

## WAN CONNECTIONS

### T1: Another Port in the Wall

Though it may appear as just another port in the wall, a T1 link is anything but that. Behind that wall plate is a high-bandwidth digital circuit operating at 1.536 Mbps, or about one-sixth the speed of Ethernet. In practical terms, it's the most common way to connect your LAN to the rest of the world.

Traditionally, T1 circuits were used to connect a voice PBX to the telephone company's central office. On the data side, T1 was a fairly expensive way to connect the LANs of two geographically distant offices; the price depended on the distance between the offices. Over time, cost-conscious companies have turned away from such expensive point-to-point connections, looking to frame relay or the Internet to provide the backbone network and often using T1 lines for access to the backbone.

How you purchase a T1 circuit has changed as well. Three years ago, you typically ordered a T1 directly from a Baby Bell carrier such as Bell Atlantic, NYNEX, or PacBell for short, regional connections, or from an interexchange carrier like AT&T

or Sprint for long-haul connections. But a couple of major changes have occurred.

First, deregulation in the carrier markets has allowed other players to enter the game. In the past, you had only one choice, but these days big companies like Worldcom and smaller players like Brooks Fiber can bid on your job, often giving you a better price or a shorter lead time.

Second, you no longer have to deal directly with the carrier. For Internet connections, the Internet service provider (ISP) will do it for you. Most of the time, having one point of contact—your ISP—can reduce your headaches. Often, though, you can cut weeks off the lead time or reduce your monthly circuit cost by doing the legwork and arranging for your own circuit. Playing middleman between the ISP and your chosen circuit provider can be frustrating. You may have to facilitate the communication between the two parties, and your promised date can be pushed back as the ISP and circuit provider learn how to work together.

Although most people order a full T1 circuit, *fractional T1* is also available. A T1 circuit is made up of 24 64-Kbps channels, and you can opt to pay for only a fraction of them. Another wrinkle is called *switched T1*. Most T1 circuits are dedicated, meaning that the connection is always live and exists between two specific points. A switched T1 circuit works like a regular phone line or ISDN line in that you can make calls to other switched T1 lines.

To terminate your T1 connection, you need a CSU/DSU; you also need a router to connect it to your network. These can be purchased either directly or from your ISP. If you're using the T1 circuit to carry voice and data, you'll need a T1 multiplexer, a device that splits the circuit into multiple chunks that you can split between your voice and data requirements.

For a full T1 circuit, expect to pay somewhere between \$200 and \$700 per month, with a one-time installation charge of between \$200 and \$500. Prices vary by region. For Internet connections, don't forget the bill from the ISP, which will range between \$800 and \$2,000 per month for the portal into the Internet. Lead time for getting a T1 connection can vary from two weeks to a painful six or eight weeks, so plan ahead.

—Robert P. Lipschutz



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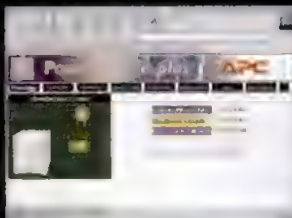
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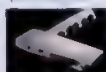


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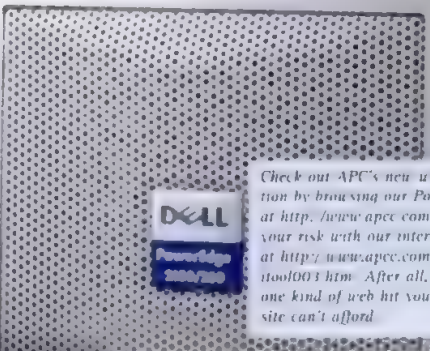
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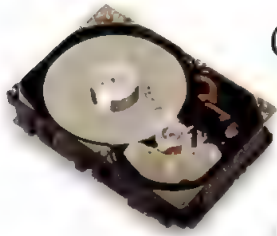
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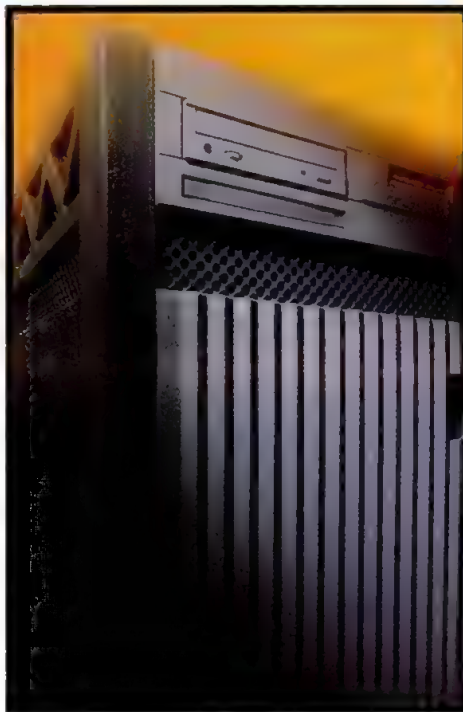
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BayStack automatically stores the new configuration in flash memory on a PC Card. Quick2Config lets you maintain PC-based backup images of your router configurations, which can be used to configure other Baystack routers at a later date. You can also manage the BayStack using the optional Site Manager (\$200 list), Bay's enterprise-wide network management software, which lets you monitor several routers simultaneously in real time.

The BayStack comes in a rack-mount chassis, with all connectors mounted on the rear panel. The slot for the system's flash ROM PC Card and three LEDs are mounted on the front panel. The LEDs indicate that the system is powered up and running, but that's about it.

**BayStack Access Node.** List price: Tested configuration, \$2,895. Bay Networks Inc., Santa Clara, CA; 800-822-9638; www.baynetworks.com. Circle 955 on reader service card.

## Cisco 1601



The easiest to set up of all the products we tested, Cisco Systems' Cisco 1601 router is more than just a pretty interface. This \$1,895 router includes one asynchronous and one high-speed synchronous serial WAN interface, which can handle speeds up to that of T1, and it also has one expansion slot, which can accept either a second high-speed serial port or an ISDN BRI interface. The Cisco 1601 can also support frame relay.

Like the Ascend Pipeline 130 T1, the Cisco 1601 supports Network Address Translation (NAT) and has a Dynamic Host Configuration Protocol (DHCP) server built in. Another feature the Cisco 1601 offers is an IP-to-IPX gateway that lets clients running only the IPX protocol connect to the Internet. Though Cisco's unit is similar to the Ascend Pipeline 130 T1, one thing the unit doesn't share with the Ascend router is its performance: Though all the products performed similarly on our tests, the Cisco 1601 gave the best results.

If you're familiar with Cisco's products, you know that ease of use hasn't always been their strong suit. Like Cisco's larger routers, this unit uses Cisco's routing software, IOS. IOS is extremely flexible, but as we've said many times in our reviews of Cisco products, it's difficult to learn. It's a command line language, so users must have at least a basic understanding of key IOS commands and concepts before they can configure an IOS router. But Cisco's 1600-series routers eliminate the need to know IOS by using two separate software solu-

tions, ClickStart and ConfigMaker.

To establish a basic configuration, you can use ClickStart, a Web-based configuration program built into the Cisco 1601. ClickStart runs like a mini-Web server on the router itself. To configure the router,



**ONE ROUTER, TWO ROUTES:** The Cisco 1601 routes T1 traffic to one site, ISDN to another.

you point your Web browser to the router's IP address, fill in an HTML form, and press a Submit button. ClickStart also provides basic

real-time monitoring of the router's activity.

The Cisco 1601 also comes with ConfigMaker, Cisco's new GUI-based net-

work management software (for additional information on configuration software, see the sidebar "Router User Interfaces"). ConfigMaker lets you design and configure an entire network of routers using a drag-and-drop user interface similar to that of Visio Corp.'s Visio. You can run ConfigMaker on any PC running Windows 95 or later, and then use the PC's serial port to deliver the configuration information to the routers via the routers' serial ports. Using ConfigMaker, we were able to configure our two-router test network in about 20 minutes.

Underneath the graphical front end, the unit still provides all the features and standards support of an IOS-based router. The Cisco 1601 can route IP and, optionally, IPX and AppleTalk, and it can bridge other protocols as well.

**Cisco 1601.** List price: \$1,895. Cisco Systems Inc., San Jose, CA; 800-553-6387, 408-526-4000; www.cisco.com. Circle 956 on reader service card.

## SUMMARY OF FEATURES

### T1 Routers

|                                       | Ascend Pipeline 130 T1 | BayStack Access Node | Cisco 1601 | Digital RouteAbout Access EI | 3Com Office-Connect NET-Builder 141U |
|---------------------------------------|------------------------|----------------------|------------|------------------------------|--------------------------------------|
| ■ YES ■ NO □ OPTIONAL                 |                        |                      |            |                              |                                      |
| Products listed in alphabetical order |                        |                      |            |                              |                                      |
| List price of tested configuration    | \$1,995                | \$2,895              | \$1,895    | \$1,950                      | \$1,495                              |
| Number of expansion slots             | None                   | 2                    | 1          | None                         | None                                 |
| Number of V.35 interfaces             | None                   | 2                    | 1          | 1                            | 1                                    |
| Number of status LEDs                 | 5                      | 9                    | 8          | 8                            | 26                                   |
| 10Base-T/Coax/AUI                     | ■ ■ ■                  | ■ ■ ■                | ■ ■ ■      | ■ ■ ■                        | ■ ■ ■                                |
| T1 CSU/DSU                            | ■                      | ■                    | ■          | ■                            | ■                                    |
| SNMP management/Firewall              | ■ □                    | ■ ■                  | ■ ■        | ■ ■                          | ■ ■                                  |
| Data encryption                       | ■                      | ■                    | ■          | ■                            | ■                                    |
| Token-Ring version available          | ■                      | ■                    | ■          | ■                            | ■                                    |
| ISDN dial backup                      | ■                      | ■                    | ■          | ■                            | ■                                    |
| Second destination                    | □                      | ■                    | ■          | ■                            | ■                                    |
| <b>WAN Protocol Support</b>           |                        |                      |            |                              |                                      |
| PPP/Frame relay/HDL                   | ■ ■ ■                  | ■ ■ ■                | ■ ■ ■      | ■ ■ ■                        | ■ ■ ■                                |
| Switched 56                           | ■                      | ■                    | ■          | ■                            | ■                                    |
| <b>Routed Protocols</b>               |                        |                      |            |                              |                                      |
| IP/IPX/AppleTalk                      | ■ ■ ■                  | ■ □                  | ■ □        | ■ □                          | □ □ □                                |
| DECnet/SDLC                           | ■ ■ ■                  | ■ ■ ■                | ■ ■ ■      | ■ ■ ■                        | □ □ □                                |
| Bridges IP/IPX/AppleTalk              | ■ ■ ■                  | ■ ■ ■                | ■ ■ ■      | ■ ■ ■                        | ■ ■ ■                                |
| Bridges DECnet/SDLC                   | ■ ■ ■                  | ■ ■ ■                | ■ ■ ■      | ■ ■ ■                        | ■ ■ ■                                |
| <b>IP Support</b>                     |                        |                      |            |                              |                                      |
| Network address translation           | ■                      | □                    | ■          | ■                            | ■                                    |
| DHCP server/IP-to-IPX gateway         | ■                      | ■ ■                  | ■ ■        | ■ ■                          | ■ ■                                  |
| <b>ISDN Support</b>                   |                        |                      |            |                              |                                      |
| Requires NT-1                         | ■                      | ■                    | ■          | ■                            | ■                                    |
| Auto SPID detection                   | ■                      | ■                    | ■          | ■                            | ■                                    |
| HiFi compression                      | ■                      | ■                    | ■          | ■                            | ■                                    |

\* This product can route to a second destination only if the system is not configured for boundary routing.



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## Digital RouteAbout Access EI

Housed in a diminutive case, the RouteAbout Access EI, from Digital Equipment Corp., is a fast and flexible router that placed a close second on our performance tests. Similar to the BayStack Access Node, the RouteAbout lets the network administrator prioritize WAN traffic based on network protocols. The RouteAbout can be used as a standalone router or installed as a component in Digital's DEChub 90 and MultiSwitch 900 chassis, allowing it to become part of a larger system including hubs, routers, and switches. And like the other products in our roundup, the RouteAbout supports frame relay in addition to T1 and ISDN. Like the other products in our roundup (except for 3Com's), the RouteAbout does come equipped with a Windows-based configuration package. You can purchase the Windows-based clearVISN management application as an option, however (\$4,995).

All the RouteAbout's connections (Ethernet, V.35 serial, ISDN, and system console) attach to the front panel. Eight status LEDs show Ethernet and WAN activity, a feature we've come to appreciate when troubleshooting unresponsive routers. The ISDN interface requires an external NT-1 unit, a disappointment in today's plug-and-play ISDN marketplace.

For those who don't need the ISDN inter-



**DOUBLE DUTY:** The RouteAbout can operate as a standalone or chassis-based router.

face, Digital offers the RouteAbout EW, which includes two serial interfaces. You can use one serial interface for a leased line or frame-relay connection and the other for a dial-up modem backup.

Our test routers arrived without configuration software, so we had to configure the units using a terminal attached to the RS-232 administration port. Thanks to the excellent documentation and protocol-

specific quick-start guides, we were able to get both of the routers up and running in just a few minutes.

We also tried out the Router Configurator, which we downloaded from Digital's Web site. Like Cisco's ConfigMaker, it allows you to build configurations for multiple routers and then deliver the configuration data to each router via a serial interface or IP connection. Unlike some graphical interfaces, it provides access to the full suite of configuration options available in the RouteAbout. The software can be used to configure many current-model Digital routers.

The software loads from a flash ROM, and updates are field-installable. An included CD-ROM contains a backup copy of the router firmware. The RouteAbout Access EI is covered by a one-year warranty, and Digital offers extensive training and on-site service options nationwide.

**RouteAbout Access EI.** List price: With IP routing, \$1,950; with full protocol suite (IP, IPX, DECNet, AppleTalk), \$2,390. Digital Equipment Corp., Littleton, MA; 800-859-1758; fax, 508-392-0603; [www.digital.com](http://www.digital.com). Circle 957 on reader service card.

## 3Com OfficeConnect NETBuilder 141U

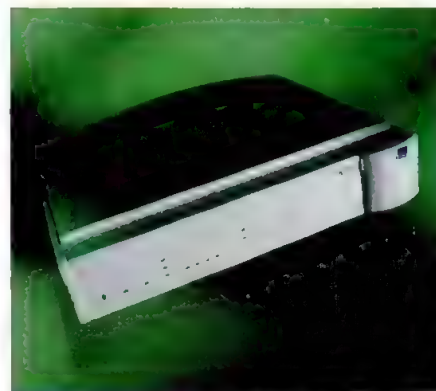
Approaching remote connectivity from a different tack, the OfficeConnect NETBuilder 141U, from 3Com Corp. (\$1,495 list), relies on the presence of a member of the 3Com SuperStack II NETBuilder family of routers at the central site to provide routing functionality. The NETBuilder 141U we tested provided good performance, excellent flexibility, and amazingly simple configuration.

The first thing we noticed about this product after we unpacked it was status LEDs; there were a lot of them. The NETBuilder 141U has 26 LEDs that show all aspects of the unit's operation, including ISDN and Ethernet status and traffic. The next thing we noticed was the excellent documentation. A color-coded road map graphically illustrates the most common configuration and troubleshooting tasks, and a very thorough installation reference details each of the NETBuilder 141U's configuration commands. The unit comes equipped with one serial, one ISDN, and one Ethernet port. The ISDN line can be used as the primary link to the central site, or it can be configured as a backup or overflow link for WAN connection on the serial port.

**Net  
Tools**  
T1 ROUTERS

3Com uses a protocol it calls Boundary Routing to connect client routers to the central site router. The client routers pass all LAN

traffic with off-LAN destination addresses to the WAN interface. To test this, we connected the NETBuilder 141U to a 3Com SuperStack II NETBuilder Remote Office 427 router, which acted as a central site router. The NETBuilder 427 router forwarded the traffic to the Ethernet interface. The central site router dynamically builds a table of traf-



**DIFFERENT STROKES:** The NETBuilder 141U uses Boundary Routing or optional IP routing.

fic filters so that WAN traffic is kept to a minimum.

There are several advantages to 3Com's Boundary Routing protocol. First, it eliminates the need to create and maintain a detailed routing table at each remote site. Second, it allows client routers in separate locations to share the same IP subnet, thus conserving IP address space and making the separate LANs appear as a single subnet. Finally, it allows the central site router to control all of the remote client routers, providing centralized administration and simplified client setup and maintenance.

Configuring the NETBuilder 141U was extremely easy. In fact, the NETBuilder 427 configured the remote router automatically once it detected the remote site router on the network.

3Com also offers a conventional IP and IPX routing software option (\$995 list), which can be used instead of Boundary Routing. This allows the 3Com products to interoperate with non-3Com routers using industry-standard routing and WAN protocols.

**OfficeConnect NETBuilder 141U.** List price: \$1,495. 3Com Corp., Santa Clara, CA; 800-638-3266, 408-764-5000; fax, 408-764-5001; [www.3com.com](http://www.3com.com). Circle 958 on reader service card. **PC**

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† As compared to an existing 48-port Total Control Remote Access Concentrator.

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# Net Tools

FROM THE BENCH

## NETWORK ANALYZERS

### Looking Inside Your LAN

By Steve Rigney

Even the best-planned networks can grow too fast and become bogged down by unseen problems. You may think you installed everything correctly, but the network keeps slowing down. Sometimes the only way to fix these invisible problems is to look deep inside your network—into the cable itself—with network analyzers.

In this roundup, we look at two 32-bit Windows 95- and Windows NT-based software analyzers, Triticom's LANdecoder32 and Network Instruments' Observer. Both of these solutions are extremely easy to configure and provide detailed information about your network's health. But unless you're familiar with octets, multicasts, and packets, you'll need to do some homework. These products don't explain much of the monitored information.

LANdecoder32 is the more powerful and geared for the more experienced administrator. It provides both local and distributed monitoring, and includes special network drivers to gather more error information and provide better performance. LANdecoder32 also provides more detailed packet filter information and includes expert diagnosis that can help you find common problems on your network. The product also lets you monitor multiple components and network segments simultaneously.

For network administrators who need basic traffic analysis, Observer offers better documentation, an intuitive interface, and detailed graphs for all of the infor-

mation it captures. Other nice utilities include one for node discovery and a traffic generator. Observer doesn't scan as many network protocols as LANdecoder32, and because it uses only NDIS drivers it can't tell you where the errors originated.

#### Triticom LANdecoder32

As its name implies, LANdecoder32 is a 32-bit Windows 95- and Windows NT-based network analyzer that not only monitors

Sniffer, but at only \$1,995 (list) for a single license it is less expensive. Like Observer, the product works on any 10/100-Mbps Ethernet or Token-Ring network.

LANdecoder32 is really a combination of two types of network analyzers: remote and local. You can configure the software to act as a distributed analyzer and monitor Remote Monitoring (RMON) probes in routers, bridges, and other network gateways. Using the Simple Network Management Protocol (SNMP), the PC running LANdecoder32 communicates directly with the probes. In addition to monitoring the probes, LANdecoder32 will also alert you if any alarms or problems occur.

LANdecoder32's second function, and the one we concentrate on in this review, is to serve as a local network monitor. In this mode, it can monitor up to 85 network protocols and track all your network traffic. The program includes real-time monitoring of network utilization, protocol distributions, source and destination

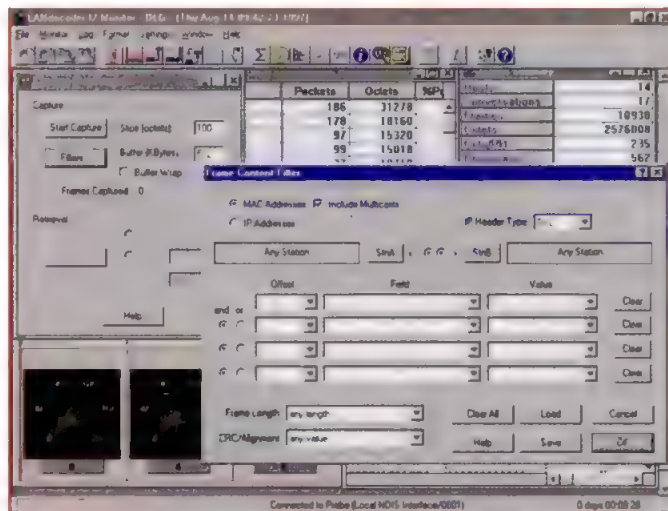
also provides a unique AccuCapture driver that works with only a handful of network adapters.

The AccuCapture driver is faster than NDIS and lets you capture station errors. Although we recommend using the AccuCapture driver, you may have to buy a network adapter that supports it. A list of adapters that support AccuCapture is available on Triticom's Web page, at [www.triticom.com](http://www.triticom.com).

After you have used the monitor utility to capture data, you can invoke the Protocol Decoder to view and analyze the information at a lower level. The decoder is a network sniffer that actually takes a network packet apart and examines the information that was traveling across the wire. To make things easier to troubleshoot, you can set up capture filters. For example, on our tests, we set up a filter to capture only the IPX packets traveling between our client PC and a NetWare server. The decoder displays the information with different colors to indicate status: A green text line means that everything is acceptable, but a red text line reveals an error. All the commands in both the monitor and decoder provide context-sensitive help, but the help only illuminates how to use them, not what the results mean.

Unless you live and breathe network packets, you'll love the Expert Diagnosis utility built into the decoder. This tool looks at your captured data and compares it with data for several common network problems, such as multiple IP addresses for a single client or data that is traveling only one way. The Expert also provides a basic example of how to track down the problem. The examples don't provide much information on how to fix these issues, but at least you'll know where to start looking.

LANdecoder32 includes several alarms you can set to alert you to problems with utilization, frame rates, errors, intruder detection, multicast rates, and other data. You can set thresholds for what level a monitor should reach before it generates an error mes-



**CUSTOM FILTERS:** LANdecoder32 lets network administrators create custom capture filters to analyze specific network traffic.

but also captures and decodes network traffic information. The product provides both local and remote network analysis and works with standard network drivers and special AccuCapture drivers. LANdecoder32 offers most of the bells and whistles of high-end, hardware-based network analyzers such as Network General's

packets, and any network errors. You can capture the information for viewing at a later time or view it in real time using your choice among the various graphs, meters, and columnar windows provided.

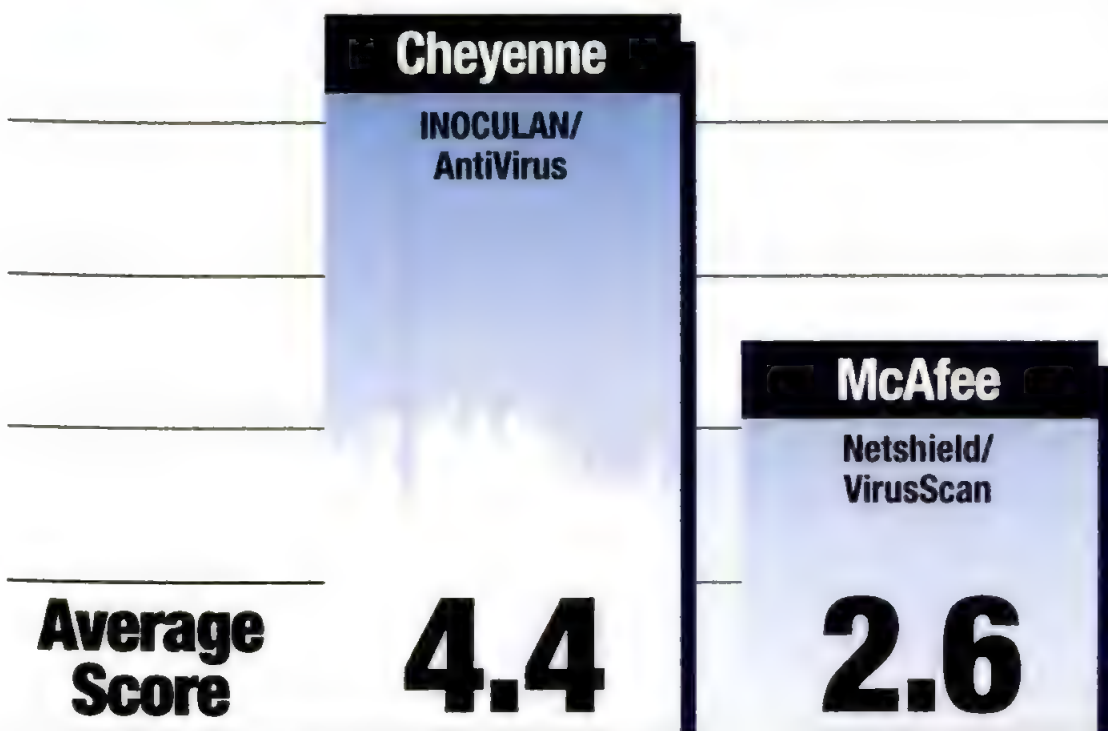
We found it quite easy to install the product using the Network Driver Interface Specification (NDIS) drivers. LANdecoder32



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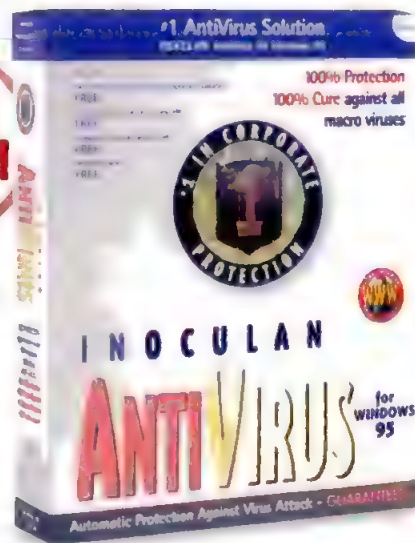
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## CROSS TALK



Frank Dertler

Leon, these software-based network analyzers are great for network administrators on a budget. You get most of the important monitoring tools, filters, and alerts for thousands of dollars less than you'd pay for some of the high-end analyzers like Network General's Sniffer. And Triticom's LANdecoder32 even gives you powerful diagnostic tools.

True, Frank, but I especially like the Expert screen that comes as part of Network General's Sniffer. Network General has compiled an extensive database that it can use to pinpoint common network problems. It can even suggest corrective measures. These lower-priced analyzers give you a lot for your money, but they still have some catching up to do.



Leon Erianger

sage or log. If you want to monitor your network over time, you can configure baselines indicating where you would like your network traffic levels to stay. Snapshot reports let you save a picture of your network traffic at certain times of the business day.

**LANdecoder32, Version 1.10.** List price: Single license, \$1,995. Triticom, Eden Prairie, MN; 612-937-0772; fax, 612-937-1998; www.triticom.com. **Circle 951 on reader service card.**

### Network Instruments

#### Observer

Though it doesn't capture as many protocols as LANdecoder32 or include expert diagnosis and RMON monitoring, the LAN analyzer Observer (\$695 list) is still a useful and reasonably priced tool for monitoring network traffic. And Observer has some unique features, including a long-term analyzer, Traffic Generator, Web Observer, and offbeat (but useful) diamond-shaped graphs for displaying network utilization.

We found the product a snap to install; refreshingly, it comes on a single floppy disk. Like LANdecoder32, Observer runs as a 32-bit application on a Windows 95 or Windows NT PC and works with the standard NDIS drivers that come with most network adapters.

The documentation that comes with Observer is more detailed

than that included with LANdecoder32, but both products offer excellent online help. One wrinkle: Observer is always sold as a demo version that provides only sample data. To enable it, you'll have to fax information to the company and wait for the license.

Like most network analyzers, Observer lets you monitor information on packet sends and receives, network utilization, protocol distribution, and bandwidth utilization. Each one of these monitors can run in standalone mode. Unlike LANdecoder32, Observer uses the program's entire window to display this information, so you can't display traffic utilization at the same time you're looking at a protocol usage chart. Worse, we found that the current utility stops capturing data when you switch to another window.

Some of the most useful utilities are the discovery modes, which let you create a list of all of the nodes on your network. The discovery modes let you search for nodes using IPX, IP, and Microsoft's NetBIOS names. In the IP discovery mode, you can resolve a domain name with an IP address, and all of the discovery modes let you define an alias to a node address. LANdecoder32 doesn't currently let you derive the NetBIOS name from a node, a feature that we found useful in Observer.

Long Term Station Statistics (LTSS) monitors the health of



your network over time. Like other long-term analyzers, LTSS takes a sample of all of the data traveling across the network, and it lets you set the hours and days you wish to gather this sample. When you want to view the statistics, you can launch the Station Statistics utility, which provides a color-coded graph of all of the information that's been gathered.

Another excellent utility is Web Observer, which tracks the amount of network traffic going to and from a Web server. You can monitor only a single Web server at a time, but the utility includes a drop-down list of all of the IP addresses on your network, so you can switch between devices.



**UNDIVIDED ATTENTION:** Observer, from Network Instruments, uses the entire display area of the window to show individual monitors.

Like LANdecoder32, Observer includes several triggers and alarms you can use to notify you of network problems. You can set alarms for events such as bad IP checksums, frame errors, exces-

sive utilization, excessive numbers of packets, and unknown IP addresses. And you can define an action for each one of these alarms. The default action is to write the information to a log, but you can also configure Observer to perform other tasks, such as starting a specific monitor mode when an alarm is triggered.

Observer uses a diamond-shaped graph called the Network Activity Display (NAD) to show overall network activity. On the left side of the horizontal axis you see the percentage of multicasts, and on the right, overall utilization. The bottom of the vertical line shows you the percentage of broadcasts, and the top is a reference for the total number of network packets. This design seemed odd when we first saw it, but it really is an easy way to track all of this information in a single view.

**Observer.** List price: \$695. Network Instruments, Minneapolis; 800-526-7919, 612-932-9899; fax, 612-932-9545; www.networkinstruments.com. **Circle 952 on reader service card.**

### REMOTE ACCESS

## Virtual Motion's Remote-Management Course

By Kevin Young

With dial-up access nearly as commonplace as e-mail in large corporate networks, the trickle-down demand for smaller shops to get remote users connected is mounting. If you have a Windows NT 4.0 server in your network, satisfying that demand is as easy as installing the

Remote Access Service (RAS) that comes free with Windows NT. But Windows NT's RAS may leave you hungry for better user management. Virtual Motion's Remote Access Manager (starting at \$395 for an eight-port version) fills that need.

The combination of Windows NT's RAS with Virtual Motion's





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Remote Access Manager (RAM) provides a particularly solid solution for small installations. Smaller networks should be able to support users with RAS, RAM, and a modem card from a vendor such as Netaccess. Larger companies may find this combination compelling as well if a remote-access

Remote Access Manager is composed of RAM Administrator and Port Manager. With RAM Administrator, you create rules governing users, groups, and even ports; Port Manager enforces them. If you're running several RAS servers, you must install Port Manager on each, but you can manage them all from a central site using RAM Administrator.

Installation is a fairly simple matter. Once installed, Port Manager starts automatically as a service, and RAM Administrator can be launched from the start menu.

RAM's tight integration with Windows NT becomes apparent once you launch RAM Administrator. Users, groups, and ports are all displayed in an Explorer-like branching tree, making navigation second nature for Windows NT aficionados. The users and

# Net Tools

FROM THE BENCH

groups are imported straight from Windows NT's User Manager for Domains with their current RAS status maintained. From there, you can right-click on any entry to set up permissions.

The most powerful rules are those governing communications. For each port, you can create an Access Control List (ACL) that explicitly defines which users can connect to which ports.

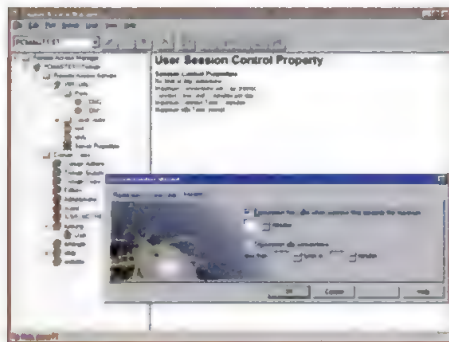
Playing an ancillary role to ACLs are Session Control Properties (SCPs), which can be used to define when users can access the network, how long they can stay connected, the amount of idle time before they are forcibly disconnected, and how many times a day they can access the network. These rules are more flexible than ACLs, because they can be applied to users, groups, and servers as well as ports. One of RAM's limitations is that you don't get the granularity

of time specification that you get in Windows NT's User Manager for Domains. You can't set up different restrictions for different days of the week; you can only set up one rule that applies to all days.

Another feature is the ability to assign a static IP address to a port or user. This is useful for connecting remote LANs to your network and guaranteeing them a specific IP address.

In our lab, we set up a Windows NT primary domain controller, a Windows NT server running RAS, and a few client machines running Windows 95. Everything worked well, though we did have a few small gripes: Users aren't warned before they're forcibly logged off; you can't monitor how long a current user has been logged on; and if you change an ACL or an SCP you must restart Port Manager (this doesn't disconnect users).

**Remote Access Manager.** List price: 8 ports, \$395; unlimited ports, \$1,595. Virtual Motion, San Francisco; 415-778-0100; [www.virtualmotion.com](http://www.virtualmotion.com). Circle 953 on reader service card.



**USER ACCESS:** Session Control Properties (SCPs) define remote users' access to the network.

solution isn't already in place. But keep in mind that the limitations of RAS—such as the limited number of modems each server can support—may make this solution impractical for networks with substantial numbers of remote users.

## MULTIPLE ACCESS

# The Truth About Trickle-Down

By Steve Buehler

One of the nice things about product development is that good ideas appear first in high-end products and then eventually gain acceptance in the middle and low areas of the market. In economic discussions, this kind of "trickle-down" theory is often derided for not benefiting society. In networking technology, however, it's giving network administrators access to some pretty powerful management tools at prices that won't threaten your corporate balanced-budget amendments.

At a recent *PC Magazine* Editors' Day, I saw two products that I'd want to have in my networking arsenal. The first was WhatsUp Gold (\$595 list), from Ipswitch ([www.ipswitch.com](http://www.ipswitch.com)). About a year ago, the company released WhatsUp (\$195 list), which was a well-thought-out and vastly underpriced tool for helping to manage small net-



Steve Buehler

works. With the release of WhatsUp Gold, the reach has been extended. It's now possible to watch for alerts on your network, obtain graphical representations of status and problems, and watch everything from afar via a browser.

If your primary concerns are covering your critical servers—mail, Web, communications/fax, and so on—the features and price of WhatsUp Gold tell a compelling story. While the network drawing tools are straightforward and somewhat simple, the user gets the ability to scan large, hierarchical networks via TCP/IP, to send pages and alerts at user-specified thresholds, and to help document the network.

Another tool that impressed me was an intranet-in-a-box product from IntraNetics ([www.intranetics.com](http://www.intranetics.com)). While most users today set up their own private intranets by buying a server, searching out applications,

and making it all work together, IntraNetics is suggesting that a more reasonable and cost-effective approach is to buy a single package. As long as that package contains the kind of applications that start-up intranet users need, a single solution makes a lot of sense.

IntraNetics' products do just that: For about \$7,500 you can get a single-box solution that includes 17 intranet applications to get your business up and running. Employee lists, organization charts, contacts, listings of open job requisitions, and several other applications make it a trivial task to get a small company with 20 to 500 users started down the path to Web productivity. This approach is a lot easier for the do-it-yourself type of network administrator, but I'll bet that VARs will start using this as a quick way to get customers on the Web at a very reasonable price.

As more users add Windows NT-based servers for specific and critical functions, tools like WhatsUp and the IntraNetics box remind me that good things come to those who wait. It's up to you to figure out whether you can afford to wait for the early adopters to get the bugs out so you can reap the benefits of their pain and experience.



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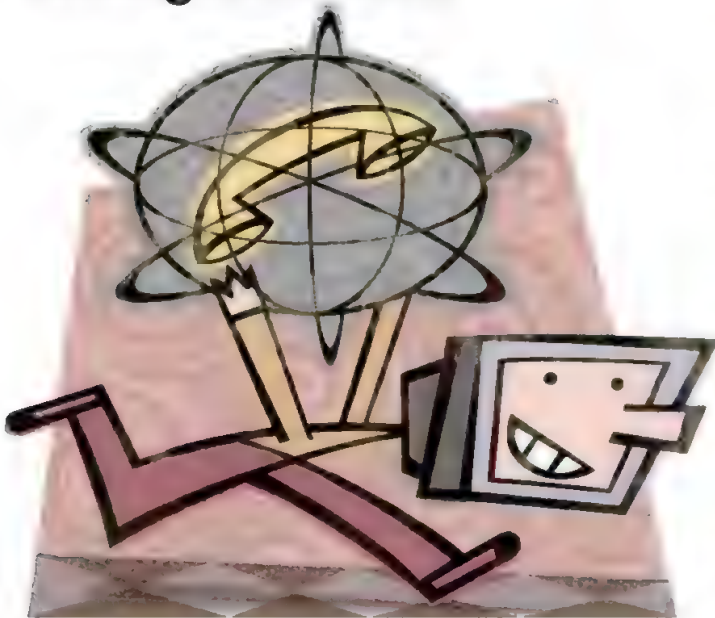
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# Net Tools

## INTERNET TOOLS

### ISP CONNECTIONS

## Routing the Internet



By Toni Pompili

**R**emember that little 5-user branch office in Loveland, Colorado? A few years back, your IT department set those users up with PCs and some phone lines so they could remotely access corporate mail, your human resources division, and the company's financial systems. Unbeknownst to you, that branch now has 20 people, and they're using the Internet. Now the phone lines are costing a

bundle each month, and the corporate remote-access servers reached their capacity two months ago. It's time for another solution: a router and a high-speed connection to your ISP.

Once the domain only of large corporations, high-speed ISDN and T1 connections are cropping up everywhere, from apartment buildings to small remote offices. These fatter pipes, connected through inexpensive workgroup

routers, make it possible to provide fast and convenient Internet access to Web sites, FTP servers, and mail servers. But how do you move your users from kludge dial-up Internet access to transparent, high-speed Internet access across your LAN?

### PERFORMANCE BEGINS AT HOME

To start with, it's likely that your branch office is already connected via a LAN, be it a Windows 95 peer-to-peer network or a network based on traditional NetWare or Windows NT servers. If not, you'll need to install a network. For Internet routing purposes, this can be pretty simple. You can use any of the various inexpensive network interface cards, such as Intel's line of EtherExpress adapters or 3Com's EtherLink adapters. Using low-cost Ethernet hubs and 10Base-T cabling, you can install a ten-person LAN for about \$1,700.

On the software side, you need an IP stack installed on every PC, preferably one that is Winsock-compliant. Winsock is the popular Windows interface to many IP stacks, providing applications with a standard way to access the network using IP. Windows 95 has made this process pretty simple by including its IP stack and Winsock as part of its standard installation CD. If your users were already accessing the Internet via modem and dial-up connections to ISPs such as AOL or Prodigy, it's likely that their Internet software has already been installed.

### ROUTING TO THE INTERNET

If your LAN is ready and your PCs are equipped with IP, all you need now is a router. We're not talking about enterprise boxes like Cisco

4500s. No, for your branch office it's going to be one of a couple of dozen inexpensive boxes designed specifically for larger workgroups (see "Talkin' About T1" elsewhere in this section). Priced between \$700 and \$3,000, these products are available from most of the major network hardware companies such as Ascend Communications, Bay Networks, and 3Com. They're also pretty simple to install.

Topographically, this kind of cigar box-size device hangs off of your Ethernet hub, just like one of your workstations. Depending on the box, you usually have at least one RJ-45 Ethernet port. Some include BNC connectors for thin coax or even an AUI for a transceiver. There's also a serial port for configuring the router with a terminal. The same port can be used to attach a modem, letting your router double as both a network router and a remote-access box.

You can usually install one of these guys out of the box in a matter of minutes. Some of the information you need will be supplied by your ISP. Many ISPs will even sell you a router and configure it to work with their service for you.

As part of the setup, you'll need to know the range of workstation addresses that will be using the router at your branch office. These addresses are provided by your ISP. You'll also need a gateway address, which is typically the IP address of one of your ISP's routers. Similarly, you'll need a Domain Name Service (DNS) entry to resolve host names, just as you would with any workstation. The router will be assigned an IP address of its own. This address becomes the gateway or router address used by all of your workstations.

## Six Steps to a Shared High-Speed Internet Connection

-  Choose an ISP that handles ISDN, T1, and other high-speed routed connections.
-  Based on the volume of Internet traffic, decide whether you can get by with dial-up ISDN or whether you need a T1 connection.
-  Select an appropriate router, making sure it physically supports your LAN and connection types.
-  Incorporate firewall security, such as packet filtering, into your router software.
-  Work closely with your ISP to optimize your router configuration.
-  Configure router filters to reduce unnecessary routing connections (especially with ISDN).



# Net Tools

## INTERNET TOOLS

How do the router and workstations work together to access the Internet in a smaller network environment? Basically, it's pretty straightforward. Say you're in your Microsoft Internet Explorer Web browser and you enter a URL, such as *www.zdnet.com*. To the workstation, this address doesn't make any sense, so the workstation routing software sends the packet to the router address, your router. The router knows that the DNS to resolve the address is at your ISP's site, so it forwards the packet across to the ISP, which in turn returns the IP address to the workstation.

Now the browser knows how to connect to the ZDNet Web site and uses the actual IP address provided by the DNS. The browser sends out an HTTP request to the ZDNet host. Again, the router recognizes that the IP address is outside of the LAN and forwards the packet to the ISP.

### CHOOSING THE RIGHT PIPE

Between the router and the ISP there can be a variety of connection types. In the past you might have installed a leased line, such as a classic 56-Kbps analog line. More recently, ISDN technology has been able to offer many appealing features that make it useful especially in sites where administrators are still unsure of their bandwidth needs.

First, unlike leased lines, ISDN lines aren't dedicated point-to-point connections. ISDN lines can be connected to any other ISDN network address. By dialing an ISDN SPID (*service profile identifier*), similar to a phone number, you have the flexibility of choosing and changing destination systems. So if you're unhappy with your ISP, you simply sign up with a new service and enter a new SPID. All this can be done without ever calling your carrier.

Next, ISDN gives you room for growth. Each ISDN connection has two digital data-bearing channels, or B channels. Each B channel can support 64 Kbps. By combining or bonding two channels, you get an aggregate bandwidth

of 128 Kbps. Again, your branch may initially work well with a single B channel but later need more bandwidth. Kick in the second B channel and you get instant gratification.

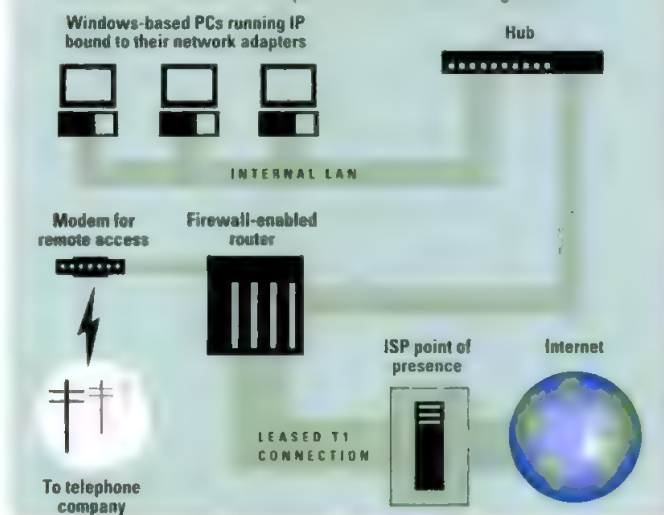
One nifty feature of ISDN is its POTS (plain old telephone service) support. You can use an ISDN line just like a regular analog line. Thus, many workgroup routers, such as Ascend's Pipeline 75, give you RJ-11 ports for connecting such devices as fax ma-

remain connected until it senses no IP activity, and it will then disconnect the call. Each time a call is made you're charged for the call setup and connect time.

Some workstation software can cause your router to make unnecessary calls. For example, the Client for Microsoft Networks

## Making the Connection

A firewall-enabled router can provide a secure, high-speed Internet connection and dial-up remote access in a single box.



chines or answering machines.

The downside of ISDN is that not all ISPs support it. Furthermore, ISDN can become expensive. Like long-distance phone calls, ISDN connections are billed by the minute. In New York, for example, Bell Atlantic charges 3 cents for the first minute and 1 cent for each minute after that. You can double these charges if you're using both B channels.

Each time you make a request to the router, such as a DNS request, the router connects to the ISP router. As on a phone line, if the ISDN router has not already dialed in to the ISP, it will make a call. It will

under Windows 95 occasionally attempts to resolve NetBIOS addresses using a DNS. This can cause your router to make a call every few minutes and can cost you quite a bit of money.

Router manufacturers attempt to identify these and other network flukes and, using what are called *filters*, prevent the router from making the extra calls. For example, you can set filters that block calls from NetBIOS source ports 137 through 139 to keep your router from making a call. Your router manufacturer can help you with these and other settings.

As your workgroup

*Once an option for only the rich and powerful, T1 circuits have come down considerably in price.*

grows into a division, you'll find that you've outgrown even 128-Kbps connections like dual-B-channel ISDN. Then it's time to consider T1. Once an option for only the rich and powerful, T1 circuits have come down considerably in price: You can now get a regional T1 connection for a few hundred dollars a month, depending on your geographic location. T1 gives you 1.4 Mbps, more than ten times the throughput of ISDN (for more information, see the sidebar "T1: Another Port in the Wall").

Whether you're using an ISDN or T1 connection, it's a good idea to protect your private LAN from the rest of the Internet world with a firewall. Even low-end routers often offer firewall options such as Ascend's Secure Access Firewall. This keeps snoopers out and requires little additional configuration.

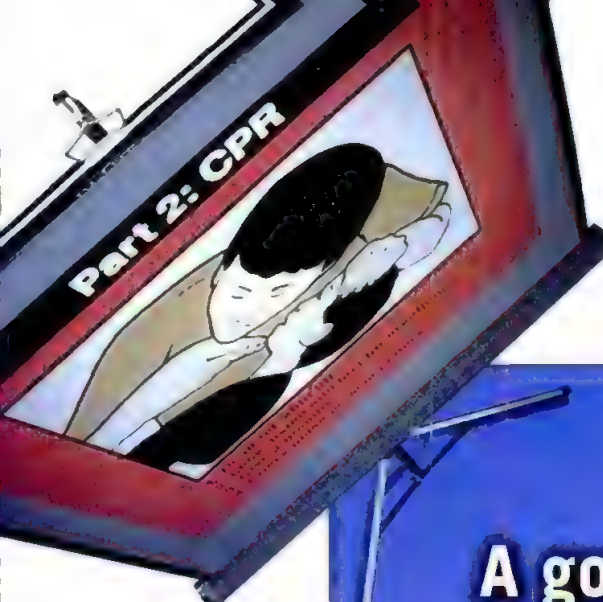
### YOUR ISP

Finally, with your connection type selected, you need to choose an ISP. Not all ISPs provide high-speed connections. Traditional carriers such as MCI or Sprint can easily provide you with such service, even bundling Internet service with your T1 or other connection.

Services that allow multiple users to access the same connections are referred to as *routed services*. Besides providing general Internet connections, these can offer you multiple POP3 mail accounts, enabling your users to access mail via your ISP. They could, of course, use any Internet POP3 mail server as well.

High-speed connections and inexpensive routers give branch offices the same sort of Internet services your users in headquarters have come to expect, and without having to open up the treasury vault. You'll find that selecting the right ISP can not only provide recommendations for services but also give you suggestions about which connections and router models to purchase. Convenient, high-speed Internet access isn't just for big sites any more. **PA**





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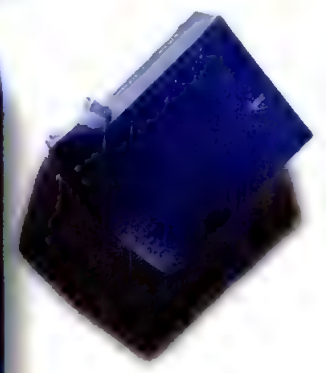


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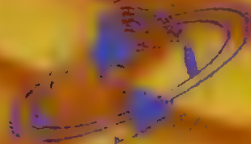
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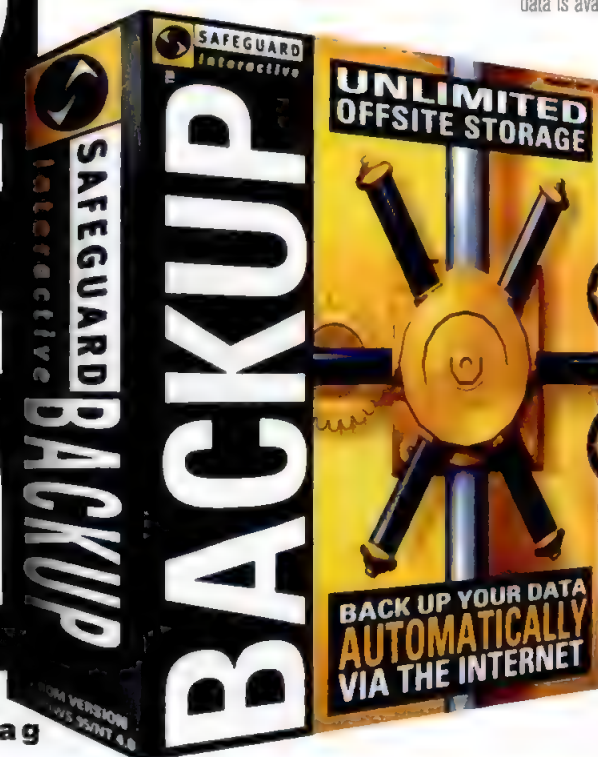
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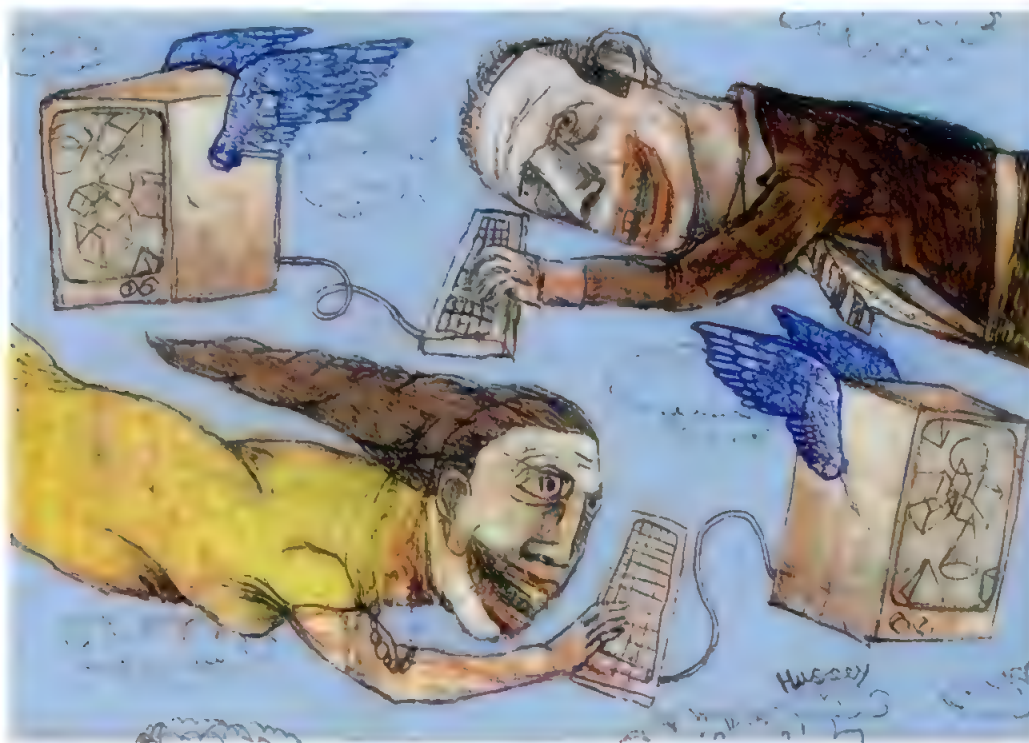
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# PC Tech



## You've Come a Long Way, BASIC!

*Microsoft's new Visual Basic 5.0 Enterprise Edition is the next evolutionary step in BASIC programming.*

By Gabrielle Gagnon

Just as Microsoft Visual Basic 1.0 was a far cry from the interpreted procedural BASIC embedded in a PC's ROM chip, Visual Basic Enterprise Edition has gone even farther into the realm of scalable, object-oriented, distributed applications development. Visual Basic is now capable of producing native-compiled, three-tiered, distributed client/server and Web-based applications with ease. And Microsoft, with its IntelliSense technology and ground-breaking RAD tools, is leading the way in developer productivity. Tasks that used to be complicated enough to give programmers ulcers are now so simple they're fun, and no other development package can boast more tools for getting the job done.

In addition to the Visual Basic development environment, the Enterprise Edition bundles Visual Modeler (an object analysis and design tool), Visual SourceSafe 5.0 (version control software), Repository 1.0, Remote Data Objects (RDO) 2.0, and Visual Studio (an online library), as well as developer editions of Microsoft SQL Server 6.5 and Microsoft Transaction Server 1.0. With all of these products in one package selling at a list price of \$1,199 (upgrade, \$699), Visual Basic Enterprise Edition is also setting a new standard for wallet-friendly development software.

Among Visual Basic products, the Enterprise Edition is the top of the line, which starts at the low end with Visual Basic Learning Edition for novice programmers and Visual Basic Profes-

### INSIDE



**▲TUTOR:** CMOS is battery-powered memory that stores configuration settings necessary to get your machine up and running. Find out what these vital settings are. *Page 311.*



**▲INTERNET TECH:** XML goes way beyond HTML in offering customization capabilities, because it incorporates SGML's power of extensibility. *Page 319.*

**UTILITIES:** RoboType saves keystrokes by adding text macro expansion to any program running under Windows 95 or Windows NT 4.0. This 32-bit utility lets you type short abbreviations in place of longer blocks of text. *Page 327.*

**SOLUTIONS:** Find out how to use an .INF file to make changes to the Windows 95 Registry; tactics for helping you recover data from a fouled-up floppy disk; quickly closing all windows on your Windows 95 desktop; and more. *Page 361.*







Envision an enterprise that's

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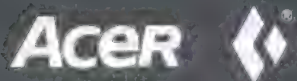
The companies that are gaining the competitive edge are those embracing the latest technology. They're extending the enterprise into virtual offices and increasing the mobile workforce to further productivity through anytime, anywhere access to information.

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sional Edition for individual developers building client/server and Internet/intranet applications. The Enterprise Edition includes the

module views and drag and drop code from the editor to the Watch window. A striking new addition to the editor is IntelliSense—

part of the intelligent development environment—and it puts a whole new spin on the meaning of IDE.

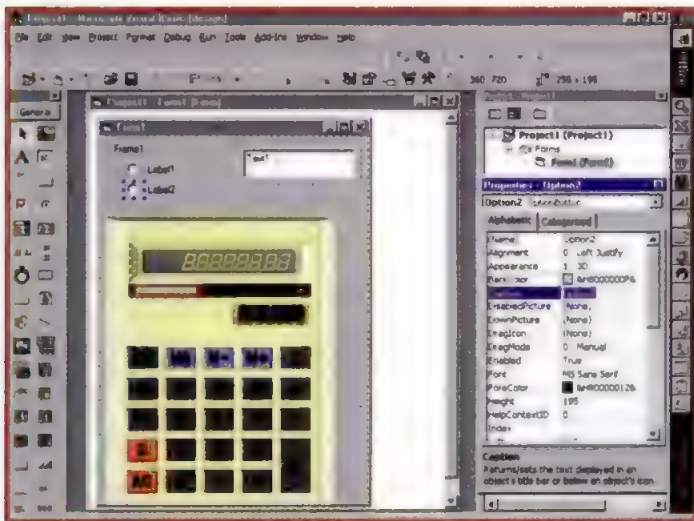
IntelliSense provides unobtrusive assistance, in the form of pop-up tips and drop-down lists, whenever a developer needs help with syntax or with filling in values. The technology will even complete words, once enough letters are typed for the system to recognize them. Syntax help called Quick Info pops up whenever the system recog-

ed, and users who need help don't have to waste keystrokes asking for it. Even veteran programmers will find the feature useful in complex applications, where there are hundreds of choices to be made.

Other productivity aids include development templates and a host of wizards, builders, and add-ins. Among them are the ActiveX Control Interface Wizard, for generating user-defined ActiveX Controls; Data Form, Property Page, and Application wizards; and a Class Builder for building and analyzing object models.

For the Internet, there is the ActiveX Document Migration Wizard, which takes existing Visual Basic forms and changes them into ActiveX Documents accessible from Internet Explorer. This lets you turn legacy applications into Web applications with a minimum of effort and get more mileage out of them. Another benefit is that IS departments don't have to retrain all their programmers to learn HTML or Java. They can continue to use Visual Basic programmers to turn out Web applications. Also, turning legacy applications into intranet applications makes them easier to deploy and maintain.

A new Setup Wizard included with Visual Basic lets you distribute ActiveX Controls and Active Documents via the Internet or an intranet and install server components remotely. When the application changes, the system re-installs only the updated components. This is a



The Visual Basic Integrated Development Environment (IDE) features drag-and-drop forms design for multiple projects.

functionality of the Professional Edition and adds team development and enterprisewide scalability. New features include multithreaded ActiveX control and ActiveX document creation, native-code optimized compiling for Intel and Alpha processors, and a number of automation and productivity tools, which Microsoft calls collectively an *intelligent development environment*.

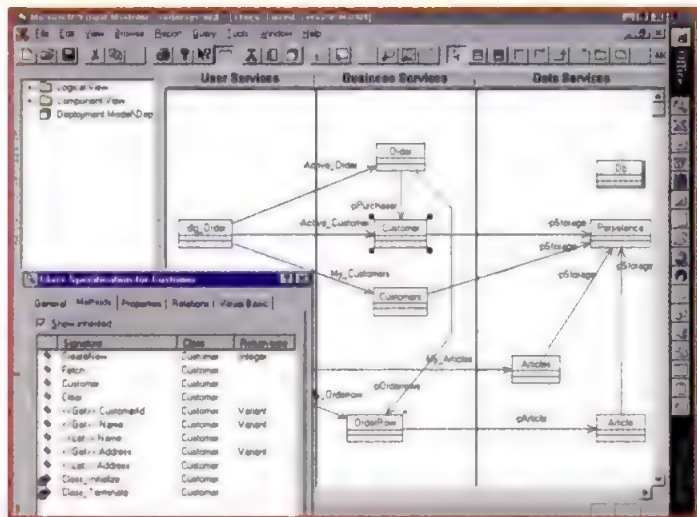
## IDE FEATURES

One of the first differences developers will notice in Visual Basic 5.0 is in its integrated development environment (IDE). The new IDE is based on the Visual C++ Developer Studio and shares a common look and feel with other packages that provide Visual Basic for Applications, such as Word and Excel. It features dockable windows that automatically link to related windows, and it permits working with multiple projects in one session. Also, users can choose whether to work with a multiple-document interface (MDI) or a single-document interface (SDI). Standard tools include a forms package, an object browser, a code editor, and a debugger. And the interface is extensible, so users can add other tools to the environment. Several add-ins, such as Seagate Software's Crystal Reports, are included.

Programmers spend most of their time writing code, so Microsoft has lavished a great deal of attention on Visual Basic's editor, making it a highly productive tool. The Enterprise Edition's editor has been improved to let developers flip between procedure and full-

functionality of the Professional Edition and adds team development and enterprisewide scalability. New features include multithreaded ActiveX control and ActiveX document creation, native-code optimized compiling for Intel and Alpha processors, and a number of automation and productivity tools, which Microsoft calls collectively an *intelligent development environment*.

For example, when writing a statement that sets a check box's Value property, a user types the check box object's name followed by a period. This action alerts IntelliSense that a property is needed, and the system displays a list of all the properties appropriate for check boxes. The user can select *Value* from the list box, then press the Tab key to insert that property into the text. Alternatively, if the user continues typing, the system will highlight the first matching item in the list until the entry is completed; then the list disappears. Users can press the Tab key to accept a highlighted item any time a list is displayed. This way users who know exactly what they want can keep typing without being interrupt-



The Visual Modeler graphically depicts an object model of VB applications. You can design a three-tiered, scalable application model and generate classes from the model or a model from an existing application.

welcome feature, since applications deployment and upgrading can be a major time sink for IS shops and commercial software developers. Anything that can simplify and automate the process reduces the chance of errors



and makes everyone's job a lot easier.

Other new features of interest to Web developers are "apartment" multithreading for ActiveX components and the ability to run ActiveX components in unattended mode. (For developers who are new to multithreading operating systems, *multithreading* is the ability to run concurrent operations on separate "threads" of execution within a shared memory space. It is more complicated than running independent processes because operating-system resources are shared, and developers have to be careful that multithreaded operations don't interfere with each other during execution. Since running separate processes is usually slower and more expensive in terms of OS resources, though, multithreading is worth the extra trouble.)

*Apartment multithreading* is a type of threading model in which Visual Basic handles thread management (shared memory, semaphores, scheduling, and deadlocks) so that developers don't have to worry about it. The effect is similar to running separate processes but without the overhead. This technology is important for Web development because of the potential for a high volume of users contending for resources on a server. If every object had to run in a separate process, the application would seem unresponsive, and the extra overhead could make even powerful servers run out of steam quickly. Allowing ActiveX components to run in unattended mode also means better scalability and performance, since objects with key business logic can be scaled up from client machines to a Web server and automatically allocated across multiple threads.

## DATA ACCESS

Data access has also been enhanced in Version 5.0. The Enterprise Edition includes the Remote Data Objects (RDO) framework, an object-oriented interface to the ODBC API. It provides a simplified, event-driven programming model to shield developers from the complexities of API programming. Developers do not have to know anything about the API; the details of connecting, query processing, and error handling are all handled under the covers by RDO. Developers just supply the parameters.

A number of new Visual Basic data access tools implement RDO technology. For example, the UserConnection Designer Wizard displays a notebook with tabs for the source name, authentication, and miscellaneous parameters, such as time-outs. Once the developer has filled in the forms, the wizard uses RDO to generate the ODBC call syntax and

# MICROSOFT VISUAL BASIC 5.0 ENTERPRISE EDITION

✓ YES ✗ NO

## Compiler Features

|                                    |       |
|------------------------------------|-------|
| Size and speed optimization        | ✓     |
| Optimized for Pentium/486/combined | ✓ ✓ ✗ |
| Compile to p-code/native code      | ✓ ✓   |
| Create debug symbolics             | ✓     |
| Background compiling               | ✓     |
| Platforms supported (host/target): |       |
| Windows 3.1                        | ✗ ✗   |
| Windows 95                         | ✓ ✓   |
| Windows NT                         | ✓ ✓   |
| DEC Alpha NT                       | ✓ ✓   |
| Compile to .EXE/.DLL/.OCX          | ✓ ✓ ✓ |

## Database

|                                       |                                    |
|---------------------------------------|------------------------------------|
| Automatic form generation from schema | ✓                                  |
| Bound database controls               | ✓                                  |
| Remote SQL debugging                  | ✓                                  |
| Edit stored procedures                | ✓                                  |
| Database modeling                     | ✓                                  |
| Local developer database included     | ✓                                  |
| Data sources                          | Microsoft SQL Server, Oracle, ODBC |

## Language Features

|                               |   |
|-------------------------------|---|
| ActiveX multithreading        | ✓ |
| Headless (non-GUI) components | ✓ |

## Editor

|                                |   |
|--------------------------------|---|
| Remappable keys                | ✓ |
| Contextual syntax display      | ✓ |
| Block and unblock comments     | ✓ |
| Declare and raise events       | ✓ |
| Drag and drop text into editor | ✓ |

## Wizards and Code Generators

|                            |   |
|----------------------------|---|
| Class                      | ✓ |
| Application                | ✓ |
| Data form                  | ✓ |
| Property page              | ✓ |
| ActiveX control            | ✓ |
| ActiveX document migration | ✓ |
| Setup                      | ✓ |
| Help                       | ✗ |
| Wizard                     | ✓ |

## Development Environment

|                                                           |     |
|-----------------------------------------------------------|-----|
| Context-sensitive help                                    | ✓   |
| Customizable workspace                                    | ✓   |
| Extensible environment                                    | ✓   |
| Add-in support                                            | ✓   |
| OLE and ActiveX client component/server component support | ✓ ✓ |
| COM and DCOM support                                      | ✓   |
| Integrated debugger                                       | ✓   |

## Programming Tools

|                                      |                     |
|--------------------------------------|---------------------|
| SDI/MDI/MS Explorer interface design | ✓ ✓ ✓               |
| Forms designer                       | ✓                   |
| Connection designer                  | ✓                   |
| Object browser                       | ✓                   |
| Repository                           | ✓                   |
| Performance-tuning profiler          | ✓                   |
| Transaction middleware               | ✓ (Windows NT only) |
| Object modeling                      | ✓                   |
| Generate code from model             | ✓                   |
| Generate model from code             | ✓                   |
| Report writer                        | ✓                   |

## Debugging Features

|                        |   |
|------------------------|---|
| Locals window          | ✓ |
| Stored procedure debug | ✓ |
| Remote debugging       | ✗ |

## Internet Features

|                                              |       |
|----------------------------------------------|-------|
| ActiveX documents/controls/server components | ✓ ✓ ✓ |
| HTTP/FTP controls                            | ✓ ✓   |
| WinSock control                              | ✓     |
| Hyperlinks/Downloading                       | ✓ ✓   |
| Menu support                                 | ✓     |

## Classes and libraries

|                                                  |     |
|--------------------------------------------------|-----|
| Create OCX and ActiveX components                | ✓   |
| Data Access Objects (DAO)                        | ✓   |
| Remote Data Object/Remote Data Control (RDO/RDC) | ✓ ✓ |
| Mail (MAPI) classes                              | ✓   |

## Project Management/Team Development

|                          |   |
|--------------------------|---|
| Project templates        | ✓ |
| Multiple-project support | ✓ |
| Notify on shared modules | ✓ |
| Version control included | ✓ |

code needed to bind parameters, set data types, and establish other technical parameters, such as row limits, for the connection. In addition to standard data-access events, the RDO framework features a Client Batch Cursor library to handle operations off-line and submit them in batch to the server; it also includes objects for optimistic batch updates and asynchronous data-access operations.

Visual Basic now also provides several visual database tools:

- *Data View* shows the databases accessed within a project and supports multiple connections to ODBC-compliant databases. (Cur-

rently, Visual Basic supports external connections via ODBC and native drivers for SQL Server and Oracle.) Using Data View, users can browse and query ODBC tables, create table definitions and database diagrams for SQL Server 6.5 databases, and create and edit stored procedures and triggers for SQL Server and Oracle.

- *Database Designer* can be used to create and modify SQL Server databases without using SQL. Its Microsoft Access-style interface provides point-and-click control over typical database administrative functions such as setting up primary and foreign keys, generating





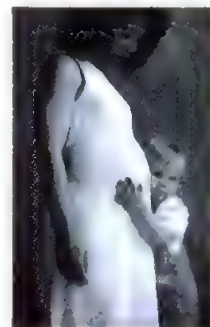
FROM A CLINICAL PERSPECTIVE, every case is different. But one thing that every birth has in common is the wonder and amazement of bringing another human being into the world. And no matter how many babies you deliver, that never changes. Not even for Dr. Linda Heffner (opposite) of Boston's Brigham and Women's Hospital who sees over 700 difficult pregnancies a year, and is still moved.



**There is no such thing as a crystal ball. However, those seeking the future can still find it in a piece of glass.**



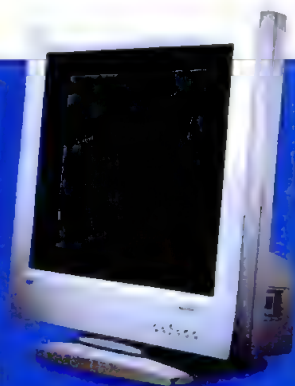
PREGNANCY IS A MIRACLE. At times, though, it's not without a degree of risk. Thankfully, modern medicine and technology can help. For example, ultrasounds allow doctors and nurses to assess how babies are doing in the womb, and to see potential problems.





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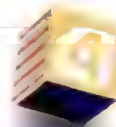
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DR. LINDA HEFFNER is Director of Maternal-Fetal Medicine at Boston's Brigham and Women's Hospital, which recently opened a state-of-the-art birthing unit geared to the comfort of families. Dr. Heffner is at the forefront of high risk obstetrics. As such, she and her colleagues evaluate how and why fetuses grow in the womb, to try to give each one the very best possible odds for a safe and healthy delivery.

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| Dimensions (W, H, D)  | 19.7 x 19 x 8.7"                 | 14.1 x 14.3 x 6.7"    |
| Brightness            | 150 cd/m <sup>2</sup>            | 180 cd/m <sup>2</sup> |
| Viewing Angle         | 160° conical XtraView technology |                       |
| LCD Type              | Active matrix                    | Active matrix         |

Both models are compatible with PC, Mac, workstation or any VESA compliant analog RGB signal, no special card required.



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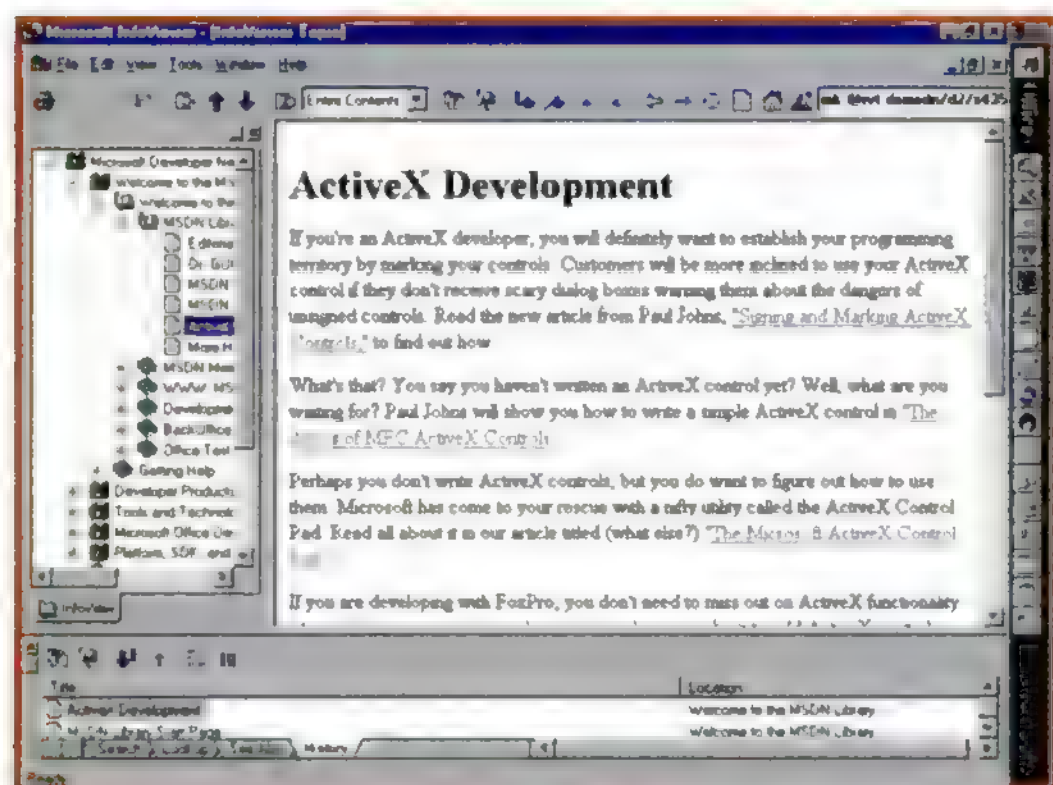
are ideal for ultrasounds. They deliver bright, sharp images, and they also have a much smaller footprint, which means that these monitors fit easily on diagnostic carts and in exam rooms.





indexes, checking constraints, and creating cascading updates and triggers.

- The *Query Designer* graphically constructs SQL queries against any ODBC data source. Users can drag and drop tables into the design pane and join tables visually across multiple tables and databases.



Visual Basic Enterprise Edition bundles Microsoft's extensive Visual Studio Information Library, including a knowledge base of more than 40,000 technical articles.

Since Version 3.0, Visual Basic has provided Microsoft's Jet Database Engine for prototyping database applications. Jet is accessed through the Data Access Objects (DAO) interface. With the new release, developers have a choice of using Jet or a relational database. Visual Basic has added ODBCdirect for mapping DAO objects to ODBC data sources via RDO instead of Jet. The advantage to this approach is that Visual Basic developers can still use the DAO tools they are familiar with for prototyping and testing, but they can also work with their target production environments' relational databases.

In addition to Jet, the Enterprise Edition now includes fully functional, limited-license developer versions of SQL Server 6.5 and Transaction Server 1.0. (These products will run only on Windows NT, so Windows 95 developers will need to switch operating systems or use network servers.)

SQL Server Developer Edition supports up to ten connections and includes SQL Server Programmer's Toolkit, SQL Enterprise Manager, and the full SQL Server toolkit. Complete online documentation is provided. Visual Basic now also includes an integrated Transact SQL (T-SQL) Debugger, which traces remote execution of stored procedures visually. With this tool you can view server-side source code, set and trap breakpoints, step through nested procedures, and

watch and set server variables.

Transaction Server is an object management system that handles transactions, object brokering, connection and resource management, thread coordination, and cross-server two-phase commits. It enables Visual Basic and other component-based applications to scale to a three-tiered architecture, and it provides a standard programming model (COM/DCOM) for distributed applications. Since server-based applications and the ability to partition applications over multiple servers are important to Web-based development, Microsoft plans to embed Transaction Server in the next release of Windows NT.

## VISUAL MODELER

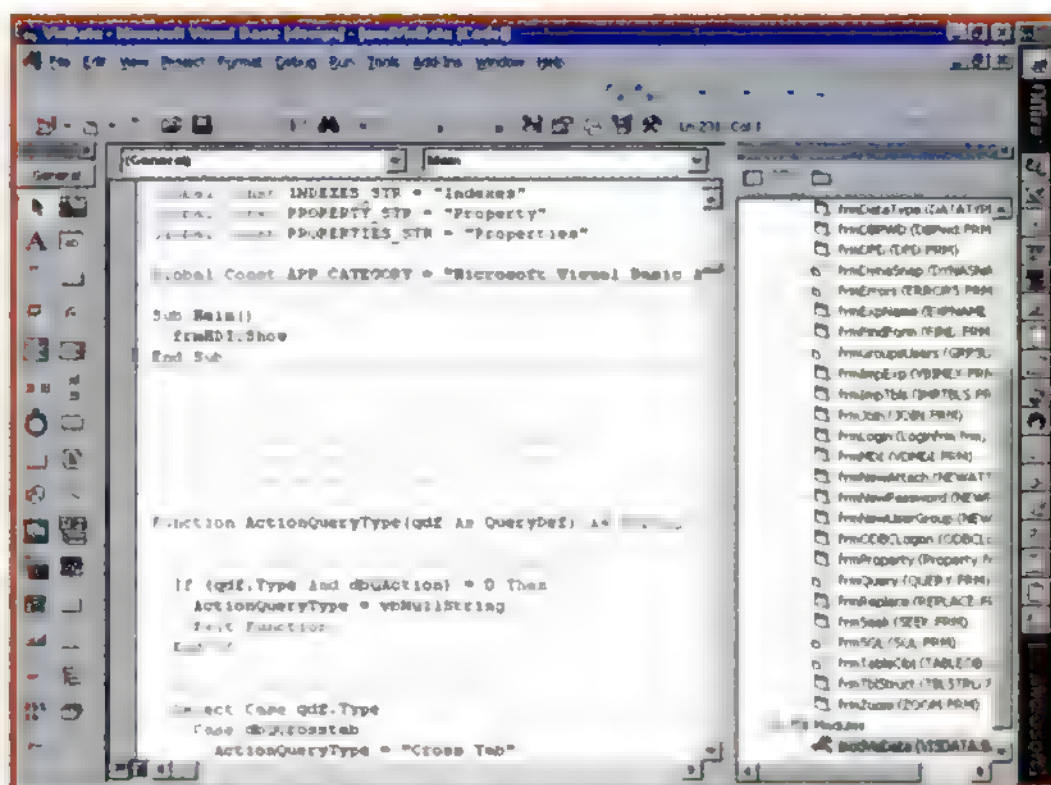
Among the new Visual Basic RAD tools supporting distributed applications, Visual Modeler is particularly useful. This CASE tool graphically depicts a component-based object model and produces Visual Basic stub code from the model. Microsoft developed Visual Modeler in conjunction with Rational Software, the vendor of Rational Rose, a popular object-oriented analysis and design product.

Designing distributed applications is not a trivial task, particularly since functional components may be used by multiple applications.

The complexity of these systems can be daunting without the aid of conceptual modeling and planning tools. Developers can use the Visual Modeler to design an object model and then generate the stub code automatically, or they can reverse-engineer a model from an existing Visual Basic application. Visual Modeler implements *Unified Modeling Language* (UML), a standard endorsed by all major industry vendors, so the models can conceivably be used with other products besides Microsoft's. Visual Modeler provides tools that walk you through the UML methodology. It also includes a tool for creating Use Case Scenarios and mapping them to your object model. However, it should be noted that although the Visual Modeler generates UML models when it reverse-engineers applications, it does not compel developers to use UML when designing their own models. Developers may use whatever modeling convention they choose.

The Visual Modeler browser presents information in three different views: Component, Deployment, and Logical. Component View shows the physical structure of the application in the form of .exe and .dll files they use. Deployment View shows the different processes of the application and the relationships among them. Logical View partitions the class diagram across logical services typically found in a three-tiered architecture: User Services, Business Services, and Data Services. Logical View shows the various objects in an application, their relationship to one another, and the categories of service to which they are assigned. This is the view that developers work with to modify the model.

The logical services may or may not reside on one machine. As applications scale up and performance needs change, logical services can be mapped to different physical entities—for example, from a single fat client/server machine to a thin client and one or more remote servers. You can add new classes and relationships or alter existing class definitions. Then, when you're ready, you can run the Code Generation Wizard to write code for the class or for the whole diagram.



Visual Basic's editor now lets you flip between procedure and full module views. You can drag and drop from the Code window to the Watch window.



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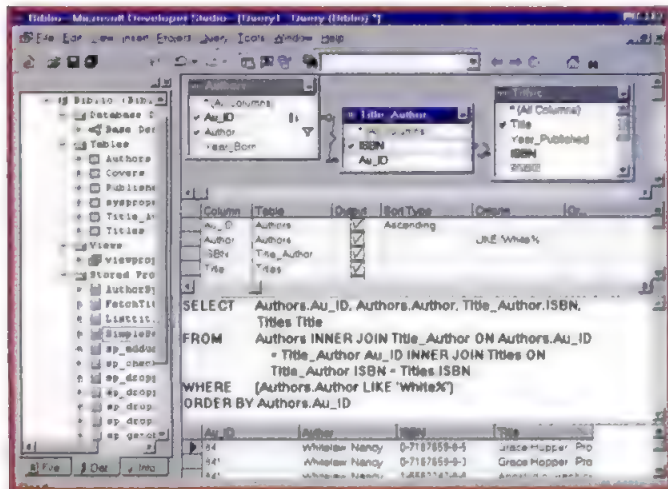
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# PC Tech

The Visual Modeler implements *round-trip engineering*; that is, you can define a model and generate code based on the model, or you can reverse-engineer a model from existing code. The latter feature is particularly useful

products, Visual SourceSafe will probably meet your needs. But it provides few features for configuration management and defect control, and little support for other companies' products or platforms. If your



The Visual Basic Query Designer lets you construct SQL queries visually against any ODBC data source.

for maintaining applications, because they have a way of evolving long after the logical models were conceived. Round-trip engineering ensures that the model is in sync with the application.

You can store UML models and other Visual Basic components in the Microsoft Repository. The Repository conforms to Microsoft's Open Information Model standard for describing objects, components, and modules. This standard model allows components to be shared and reused across multiple applications and with other products that conform to the standard.

## TEAMWORK

Enterprise development means working on project teams, and an enterprise package wouldn't be complete without tools for coordinating programming, testing, and deployment. Visual Basic 5.0 includes Microsoft's Visual SourceSafe (version control and configuration management software). Unlike some version control software, Visual SourceSafe tracks development at the project level as well as at the file level, which is useful for files used in multiple projects.

Features include a project difference facility for keeping team members' editions in sync, and an archive for separating active and completed projects into separate databases. Visual SourceSafe is well integrated into all of the latest Microsoft development and office product environments, so if your organization has standardized on Microsoft

texts on all of the company's tools and technologies. It also includes a knowledge base of more than 40,000 technical articles.

## IN SUMMARY

Given all of its provisions geared toward enhancing developer productivity, its dazzling user interfaces, and an almost mind-boggling number of features, Visual Basic Enterprise Edition continues to set the standard for RAD tools. Its foray into object-oriented modeling and distributed computing points the way to the future in applications development for the Internet and beyond. Visual Basic promises to keep BASIC a front-runner into the next millenium.

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Gabrielle Gagnon is a freelance programmer and technical writer.

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## The Mysteries of CMOS

*Your PC can't function without CMOS. In this first part of a two-part series, we explain why it is so vital.*

By Neil Randall

A lot can happen with just the flip of a switch or the push of a button. You push a button on your PC, and in a few seconds up pops your operating system and you're ready to go. It all seems so simple, but if you stop to think about what has transpired in those few seconds, you're sure to be awed by the complexity of the process.

In the time between your turning on the machine and the appearance of the operating system, your system receives power; tests itself for possible problems; checks for a keyboard, hard disks, and most other hardware; and finds and loads your operating system. In order to do all of this successfully, your machine needs to know precisely how it is configured. This configuration information is stored in memory called CMOS.

### CMOS AND BIOS

CMOS (pronounced *see-moss*) stands for *complementary metal-oxide semiconductor*. This is a type of memory chip with very low power requirements, and in PCs it operates using small batteries. In PCs, CMOS is more specifically referred to as CMOS RAM. This is a tiny 64-byte region of memory that, thanks to the battery power, retains data when the PC is shut off.

The function of CMOS RAM is to store information your computer needs when it boots up, such as hard disk types, keyboard and display type, chip set, and even the time and date. If the battery that powers your CMOS RAM dies, all this information is lost, and your PC will boot with the default information that shipped with the motherboard. In most cases, this means you'll have no access to your hard disks until you supply CMOS with the necessary information. Without access to your hard disks, you won't be able to boot your operating system.

Fortunately, today's CMOS RAM is protected by nickel cadmium batteries, which the computer's power supply recharges. Even so, it's an extremely good idea to keep a copy of all the information stored in CMOS, in case disaster strikes.

The information stored in CMOS is required by your computer's *Basic Input/Output Sys-*

*tem*, or BIOS (pronounced *bye-oss*). Your PC contains several BIOSes—the video BIOS that interfaces your CPU and video card, for example—but the most fundamental is the *system BIOS*. The system BIOS is stored on a ROM (read-only memory) chip on the motherboard and is copied at boot time to a 64K segment of upper system RAM for faster system access (RAM is faster than ROM). The role of the system BIOS is to boot the system, recognize the hardware devices, and locate and launch the operating system. Once the operating system is loaded, the BIOS then works with it to enable access to the hardware devices.

If you're using DOS, access to the BIOS is usually direct, which means an application talks to the BIOS directly. If you're using applications written for Windows 95 or NT, however, access to the BIOS is controlled by the operating system, with applications programmed to make use of standard operating-system routines to access the BIOS. It's still possible for programmers to access the BIOS directly, but if they do so, they won't be able to display the Windows 95 logo on the product box.

As soon as you turn on your machine, the BIOS runs a *power-on self-test* (POST), during

cern the processor and hard disks, but a great many more are part of the boot sequence as well. You may not even notice the initialization checks on some components until the BIOS can't find them: If your keyboard isn't plugged in, for instance, or if your floppy disk drive is missing its interface cable, the BIOS will display an error message. After the POST is complete, the BIOS looks for and then loads the operating system.

### THE CMOS SETUP PROGRAM

While the POST is in process, the BIOS gives you access to a small program, usually called Setup, that lets you examine and alter your CMOS settings. You'll see a message on your screen telling you to press a specific key (Del is common) or key combination to enter Setup, and you'll have a limited time to do so. Watch for this message, or simply hold down the appropriate key (if you know it) while the memory test is taking place. A screen will pop up with several menu options. Exactly what you'll see depends on which brand of BIOS your computer is running, but you'll probably see a menu called Standard CMOS Setup and another called Advanced CMOS Setup.

We'll focus on those two setup menus in this Tutor column and the next. In addition, we'll examine some of the options in the other CMOS Setup areas, particularly Chipset, Power, and PCI settings. Some of these might not appear on your CMOS Setup menu, but they will when you buy a new machine.

Be extremely careful when changing CMOS settings, as you can easily render your computer unbootable. Fortunately, to enter CMOS Setup, you don't need to load the operating system. Just turn on the machine and press the appropriate key combination. If your BIOS can't find the information it needs, it will inform you that you must enter CMOS Setup and make changes. Even better, today's BIOSes have auto-configuration features, which make CMOS Setup much easier than it was a few years ago.

When you exit CMOS Setup (procedures vary according to BIOS brand), you'll be asked whether you want to save changes. If you're not certain, don't save your changes. In either case, exiting will cause your machine to reboot, so you'll be able to tell immediately whether you've done something drastically wrong.

### STANDARD CMOS SETUP

The Standard CMOS Setup lets you configure time and date, floppy and hard disk drive types, keyboard installation, and pri-

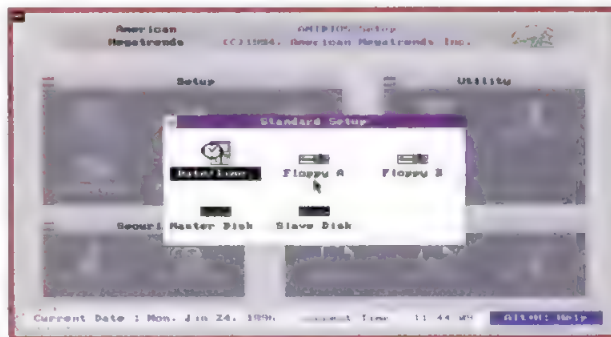


FIGURE 1: The setup screen for basic configuration for AMIBIOS.

which it completes a series of diagnostic tests and then checks for and initializes your system's hardware. You can watch this initialization on your screen: First you'll see information about the video card, then information about the BIOS version itself, and then a test of your system's memory.

Except for devices that contain their own BIOS information—for example, video cards and SCSI controllers—the BIOS initializes the devices according to the information stored in CMOS. The most obvious of these details con-



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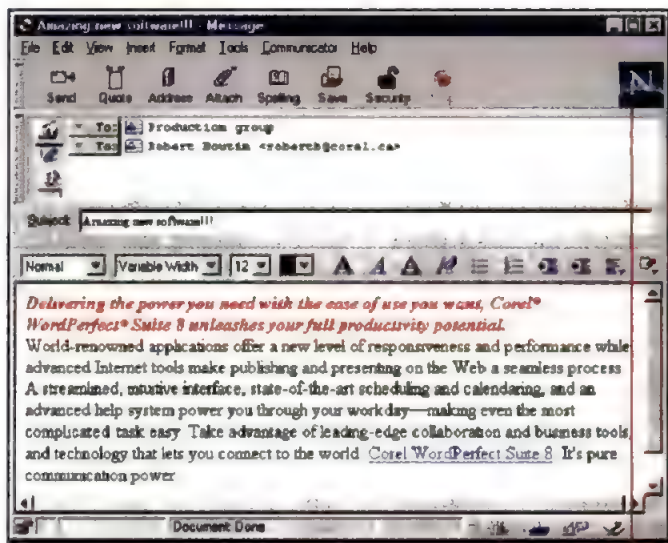
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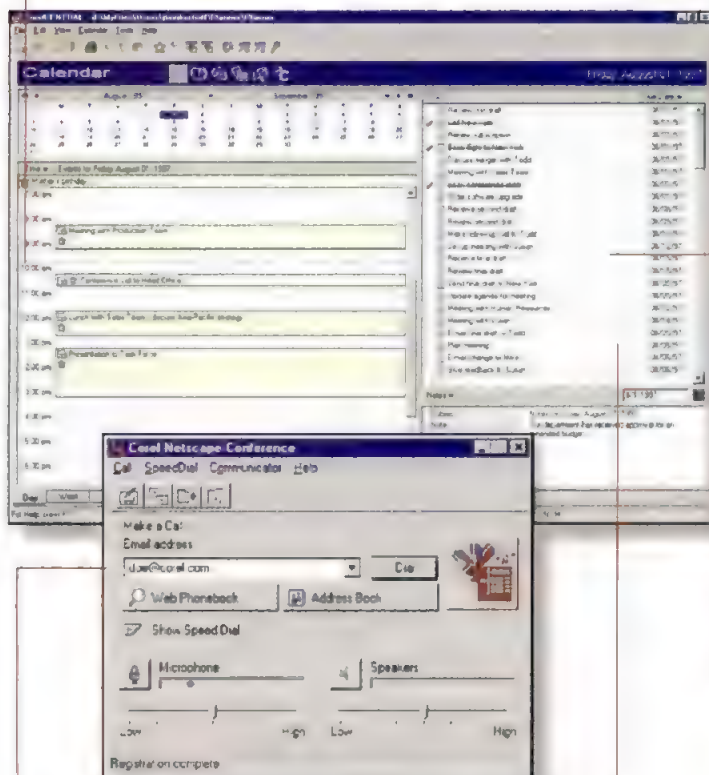
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mary display type (see Figure 1). This is the starting point for all PC BIOSes, because without a keyboard you can't do anything, without a display type you can't see anything, and without a disk drive you can't run anything. All other CMOS settings are supplemental to these few.

- The CMOS Time and Date setting is self-explanatory. Use the adjustment keys (usually listed at the bottom of the screen) to change the time and date. DOS and Windows provide a means of making these changes from within the operating system—DOS's TIME and DATE commands and Windows' Date/Time utility in Control Panel—so it's not necessary to adjust the setting in CMOS. But if your computer is running slow or fast (typically you'll be off a minute or two each month—these ain't Swiss timepieces!), simply adjust it at this point.

- The keyboard setting is also obvious. Either you have one installed (the CMOS default) or you don't. If you choose Not Installed as the option, the BIOS won't check for it during POST and, as a result, won't display an error message. You might want to do this if you suspect a faulty keyboard is preventing your computer from booting into the operating system properly, or if you're running a software demo or a Web kiosk station, allowing either no input or mouse input only.

- Your BIOS needs to know how to display information on initial boot-up. CMOS Setup gives you a choice among VGA (the standard display type) and older display types such as EGA (16-color) and possibly CGA (4-color) and MDA (text-only). Your particular BIOS might offer more. As long as you have a VGA card installed (and it's pretty much impossible to buy a non-VGA card these days), select VGA. On today's machines, VGA is the default.

- CMOS Setup gives you two options for floppy disk drives: Drive A and Drive B. Most computers today ship with only one floppy disk drive, but you can add another if you wish. Using the appropriate keys (typically PgUp and PgDn), you can cycle through the various floppy disk drive types: 360K (5.25-inch), 720K (3.5-inch), 1.2MB (5.25-inch), 1.44MB (3.5-inch), and 2.88MB (3.5-inch). The most common is 1.44MB. More recently introduced drives of 100MB and more are not supported directly in BIOS but depend instead on a separate driver.

- Hard disk configuration is by far the most complex task in CMOS Setup (see Figure 2). Fortunately, BIOSes appearing within the last couple of years usually contain built-in configuration utilities that recognize and configure hard disks automatically, but with older

systems it's still necessary to perform the configuration manually, configuring each hard disk individually.

Most of today's systems contain an EIDE (enhanced integrated drive electronics) drive controller, which can handle up to four disks (including CD-ROM drives). If you have an older IDE controller or a controller even older than IDE, you're restricted to two hard disks

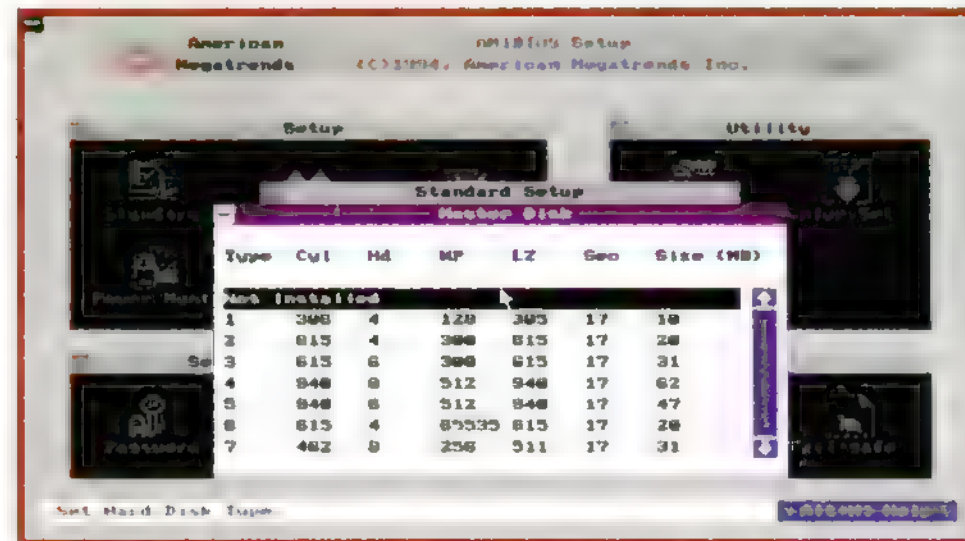


FIGURE 2: AMIBIOS's Primary Hard Disk configuration screen.

(and no CD-ROM drive). On your CMOS Setup, IDE might be called ATA or AT-bus, and EIDE might be labeled Fast-ATA.

Unless you bought identical hard disks, it's entirely likely that each disk in your system must be configured with different parameters. To configure them, you need information that can be provided only by the disk manufacturer. If you can't locate that information on the disk itself, it might be in the disk's manual. If, like most people, you have no idea what happened to the manual, then you'll have to call the disk manufacturer. But even if your system is working fine, you should enter CMOS Setup, write down the information about your hard disks, and store this information in a safe place in case anything goes wrong. Taping a sheet to the computer itself isn't a bad idea.

Note that if you have SCSI hard disks, their configuration depends on the SCSI controller, not your BIOS, and you don't configure them with CMOS Setup.

Each hard disk can be given a specific number denoting its type. On older systems, one of the preconfigured numbers (you'll likely have 46 of these) might be applicable. In most systems today, however, the disk number is 47, which means you must provide the parameters yourself. These parameters include the following, and again, if your CMOS Setup displays them, write them down for safekeeping:

**Cylinders:** This value shows the number of cylinders on your hard disk.

**Heads:** This value represents the number of heads on your hard disk.

**Sectors:** This value shows the number of sectors per hard disk track.

**Size:** This value refers to the size of your hard disk, expressed in megabytes (MB). Don't worry if this number is at slight variance with the size of the disk shown on the box in which it was shipped or in the manual. You will still have access to all the data storage space.

**Write Precompensation (WPCom):** On IDE, EIDE, or SCSI hard disks, it's a meaningless value, because IDE/EIDE drives contain

the necessary information themselves, and SCSI disks are handled by their controllers. On pre-IDE disks, however, the BIOS had to compensate for the difference in the density of data on the disks' inner tracks versus the outer tracks, and the WPCom value accomplished that. Usually, the number is either 0 or 65535.

**Logical Block Addressing (LBA):** This is an addressing scheme that's at the heart of EIDE

disk control. LBA assigns a number to each sector on the hard disk, a more efficient way to address hard disks than the older system of cylinder, head, and sector (CHS) addressing. LBA has always been used for SCSI disks, but IDE disks started to use this as an alternative addressing method in 1994. This happened to be when hard disks larger than 504MB (the maximum for CHS BIOSes) started to appear, but LBA is not necessary for large hard disks to function. What is necessary is a BIOS that can perform CHS-to-CHS translation (to map the cylinders, heads, and sectors properly), a scheme known as ECHS or XCHS. LBA is one means of allowing the BIOS to communicate with a hard disk and performing the necessary translation, and in effect it has become the standard. LBA can support disk sizes up to 128GB.

Usually it's not necessary to configure the LBA settings manually for hard disks, because BIOSes today handle the setup through auto-configuration. Because older BIOSes do not support LBA, however, manufacturers of large hard disks include a floppy disk containing a driver that allows you to use the entire hard disk.

That's it for standard CMOS settings. Next issue, we'll head into the advanced settings and beyond, including information about how to optimize your system for best possible performance. **PC**

Neil Randall is a frequent contributor to PC Magazine and the author of *The Soul of the Internet (ITCP)* and *Special Edition Using Microsoft FrontPage 98 (Que)*.



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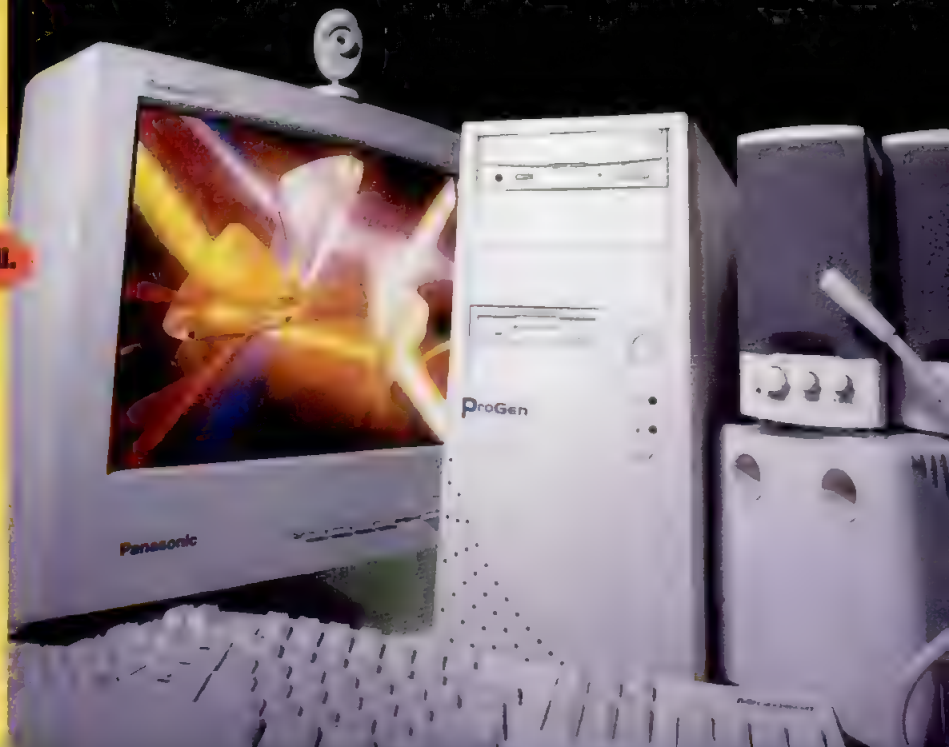
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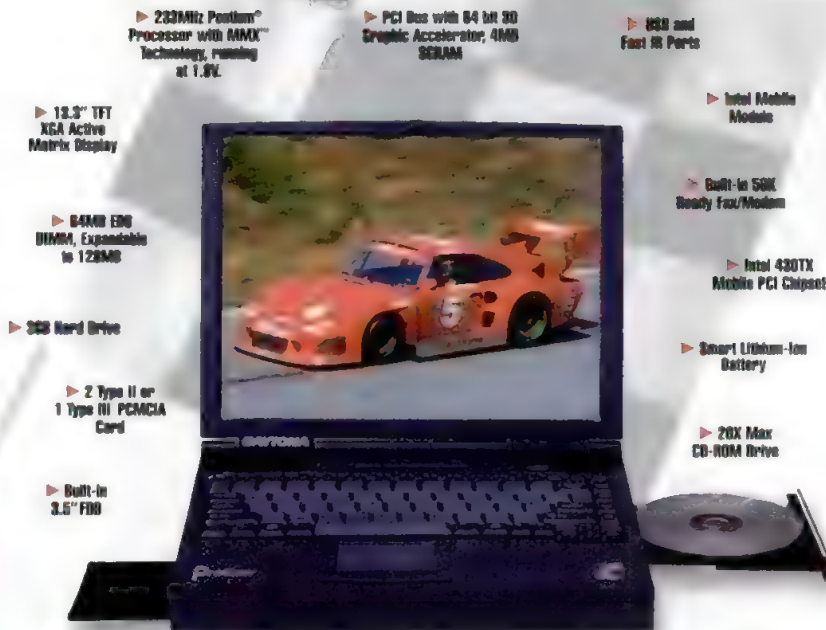
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## XML: A Second Chance for Web Markup

*HTML gave up a lot of SGML's power. XML brings back the power but keeps it simple.*

By Neil Randall

As far back as the sixties, IBM scientists were working on a Generalized Markup Language (GML) for describing documents and their formatting. In 1986 the International Standards Organization (ISO) adopted a version of this standard called Standard Generalized Markup Language (SGML). SGML offers a highly sophisticated system for marking up documents so that their appearance is independent of specific software applications. It is big, powerful, filled with options, and well suited for large organizations that need exacting document standards.

But early in the game, it became apparent that SGML's sophistication made the language quite unsuitable for quick and easy Web publishing. For that, we needed a simplified markup system, one at which practically anyone could quickly gain proficiency. Enter HyperText Markup Language (HTML), which is little more than one specific SGML document type, or Document Type Definition (DTD). Because it is so easy to learn and to implement, and because early Web browsers supported it, HTML quickly became the basis of the burgeoning Web. In fact, if SGML had been the Web's essential markup language, the Web probably wouldn't have attained the enormous popularity it now enjoys.

The problem with HTML, however, was that it quickly proved to be *too* simple. It was superb for the early days of the Web—with text-based documents that featured headings, bulleted lists, and hyperlinks to other documents—but as soon as Web authors started demanding multimedia and page design capabilities, the language started experiencing severe growing pains. Straightforward in-line graphics were fine, but you couldn't do much to place them, so page design suffered. And image maps (images with embedded hyperlinks) created new

problems and needed new solutions. Then came blinking text, tables, frames, and dynamic HTML. Every time we turn around, it seems, someone's trying to add something new to HTML, and every time that happens we end up with new incompatibilities and the need for new standards.

Why is this happening? Because, quite simply, HTML isn't *extensible*. Over the years Microsoft has added tags that work only in Internet Explorer, and Netscape has added tags that work only in Navigator, but you, as a Web author, have no way to add your own.

Undoubtedly, you've experienced the frustration of HTML's limitations as a page layout system, and just as undoubtedly you've eagerly embraced new tags and elements as they've been introduced. But to design serious sites,

customization of Web page design remains at the whim of the people who make the browsers.

The Web's many developers have recognized for quite some time the irony of all this: Whereas HTML offers no extensibility, its parent system, SGML, is fully extensible. To create a fully customized set of documents in SGML, authors develop a DTD that will control all documents in that set. This is time-consuming and can be extremely complex, but it works. The question, then, is how to capture SGML's extensibility, which serious HTML authors require, without retaining the complexity, which almost nobody wants. In other words, the issue is how to bridge the gap between SGML and HTML.

### ENTER XML

The answer is Extensible Markup Language, better known as XML. Proposed in late 1996 to the World Wide Web Consortium (W3C), XML currently exists as a pair of draft documents at [www.w3.org/pub/WWW/MarkUp/SGML/Activity](http://www.w3.org/pub/WWW/MarkUp/SGML/Activity). Its intention is to offer some of SGML's power while avoiding the language's complexity, enabling Web authors to produce fully customized documents with a high degree of design consistency. It can offer these

things because XML *is* SGML. Whereas HTML is merely one SGML document type, XML is a simplified version of the parent language itself.

XML is more than a markup language. Like SGML, it's a *metalanguage*, or a language that allows you to describe languages. HTML and other markup languages let you define how the information in a document will appear in an application that displays it, but SGML and XML let you define the markup language itself. In this sense, XML can actually control HTML documents. Think of HTML as a description system and XML (like SGML) as a system for defining description systems and you get the idea. One benefit

of SGML is that you can use it to define and control an unlimited variety of description systems, HTML being only one of these, and XML offers this advantage as well.

Like HTML and SGML, XML will require viewing software that will interpret it according to the author's instructions. In all likelihood, future versions of Microsoft Internet Explorer and Netscape Navigator will include

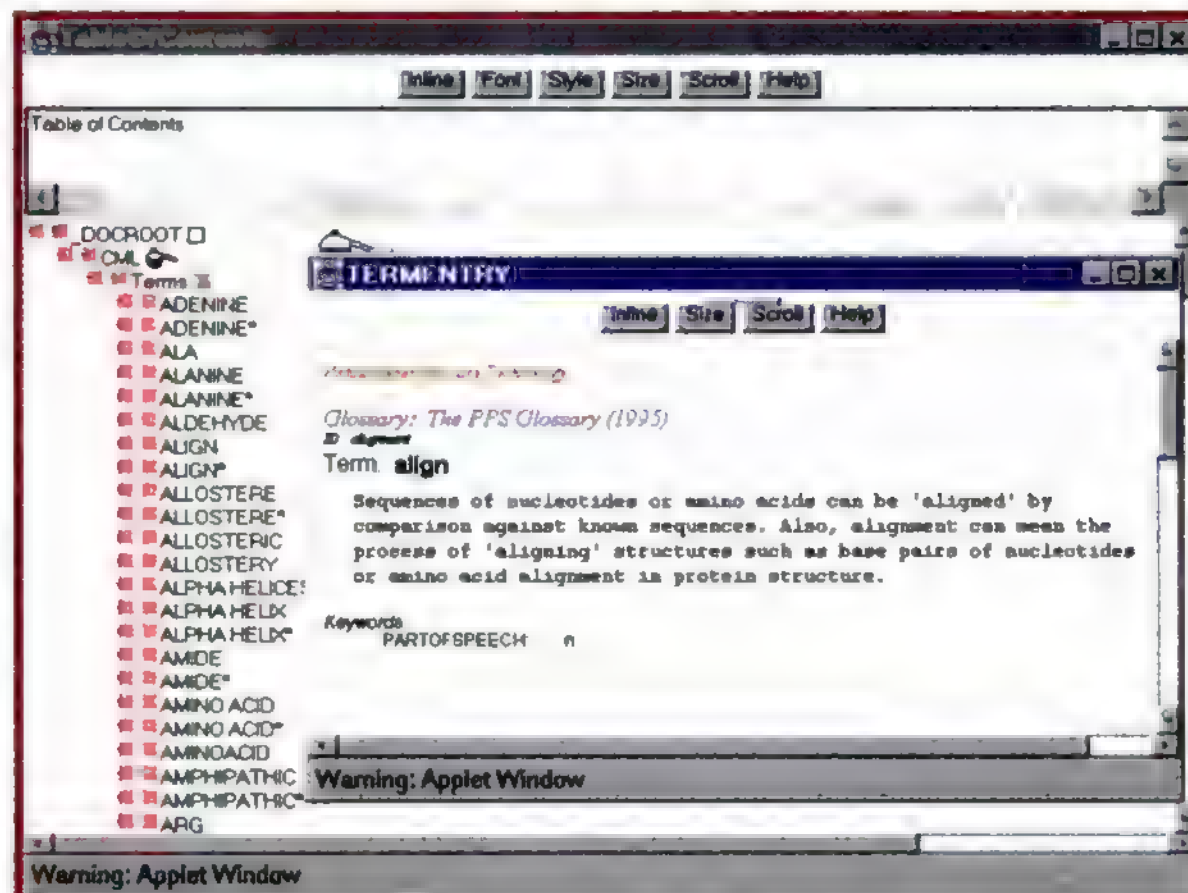


FIGURE 1: The XML browser JUMBO here shows how clicking on a term yields an individual Java window in Chemical Markup Language.

you keep needing more. Hence Java and JavaScript, hence Active Server Pages, hence all the continuing developments that are making HTML more powerful. Recent HTML developments such as Cascading Style Sheets (CSS) and dynamic HTML offer some of the necessary strength for customizing your Web designs more completely, but these additions simply highlight the growing problem. Full



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XML interpretation, but in the meantime, you might want to check out JUMBO, an experimental browser originally designed to display chemical industry documents. JUMBO is available at [www.venus.co.uk/omf/cml/](http://www.venus.co.uk/omf/cml/), where it displays an SGML/XML implementation called Chemical Markup Language, or CML (see Figure 1).

One of XML's greatest strengths is that it lets entire industries, academic disciplines, and professional organizations develop sets of DTDs that will standardize the presentation of information within those disciplines. To an extent this works against the much-ballyhooed universality of the Web and HTML, but if you work in a specialized area, you're probably aware of the need for systems that let you produce documents enabling you to communicate efficiently with your colleagues. Specialists often need to display formulas, hierarchies, mathematical and scientific notations, and other elements, all within well-defined parameters. SGML's DTD system lets you do so, and XML picks up on the DTD system without all the complexity.

One example of XML's advantage over HTML lies in its linking possibilities. HTML's linking, even though it is the basis of the entire Web, is extremely limited. You can link to internal or external documents, but the links are unidirectional and always connected to a hard-coded address. That's why you get so many "Document not found" errors.

HTML's redirection capabilities—which automatically forward the browser to another location—take care of some of these issues, but the linking portion of the proposed XML standard ([www.w3.org/pub/WWW/TR/WDxml-link-970406.html](http://www.w3.org/pub/WWW/TR/WDxml-link-970406.html)) takes linking much further. With XML, Web authors can establish multidirectional links, which not only link to a destination location but also provide information about links to the current location from other locations. As an example, an author can provide a link that will take users to a particular resource; a cross-reference link will then show all the links that lead to that resource, and the user can follow these links to their sources. XML authors can also specify what happens when a link is found, such as whether or not the link will be followed automatically, and even whether or not the linked document will be displayed within the original document. As XML linking options find their way into general use, the Web will become a much more capable hypermedia system.

## VALID AND WELL-FORMED

The DTD system is only one method of creating XML documents. DTDs offer the greatest possible flexibility and extensibility, but one of

the XML team's design goals has been to eliminate the need for building them. As a result, there are two types of XML document, those with DTDs and those without. Those with DTDs that conform to the SGML standard are called *valid* files. Documents that exclude DTDs must be *well-formed*; that is, they must conform to a specific set of standards. Valid files must be well-formed too.

A valid XML document, like a valid SGML document, opens with a Document Type Declaration, through the `<!doctype ...>` element. In addition, the document might have an XML Declaration before the DTD to specify the version of XML in use, but this isn't strictly needed. If present it takes the form

```
<?XML Version="1.0" ?>
```

with 1.0 replaced, of course, by whatever version is in effect. The XML version must be available locally or over the Net, and the XML Declaration will state its location.

The Document Type Definition's purpose is to specify the structure for the content of all documents of a certain type; thus the Document Type Declaration represents the core of SGML. It might seem strange or even impossible, therefore, that XML could let you dispense with the `<!doctype>` element completely. It does so by demanding that files be well-formed, which lets the viewer interpret them as SGML. Instead of having a DTD, the XML document must follow a series of rules, none of which are difficult for authors to master.

First, a document must begin with a Required Markup Declaration (RMD) stating that the document lacks a DTD (the code is "NONE"). This RMD occurs in the same line as the XML Declaration, in the form

```
<?XML VERSION="1.0" RMD="NONE">
```

Second, all values for attributes must be enclosed in quotation marks. Third, all elements must have opening and closing tags, unlike some elements in HTML. Other requirements dictate the type of attributes available, as well as some restrictions on the data itself. As long as you adhere to these rules you may omit the DTD, and that simple fact goes a long way toward making XML more accessible than SGML.

So what about HTML? Are your current HTML documents invalid or poorly formed or both? Not necessarily. Remember that HTML is simply one SGML DTD; as long as a document conforms to the HTML 3.2 standard, it will be all or at least mostly well-formed. All you have to do is ensure that it adheres to the XML rules for well-formed documents and

you're set. You can also run your HTML files through an SGML-aware authoring tool such as SoftQuad's HoTMetaL Pro ([www.sq.com/](http://www.sq.com/)) or turn to parsing software such as Lark ([www.textuality.com/Lark/](http://www.textuality.com/Lark/)).

## TYPES OF XML APPLICATIONS

Unless XML offers the ability to produce new kinds of applications, it won't be of great value to the Web authoring community. Much of the early development work is still in progress, but XML appears to be extremely well suited to several advanced application types.

First, because of its data structures, XML provides a good way to develop applications that let the user view data from various perspectives. Such applications can make documents more useful by sorting data according to various criteria (by name, by number, and so on) or by providing a way to toggle different information on and off. For instance, a listing that contains program information for all flavors of Windows could display only the user's version at the click of a mouse.

XML can also be applied to an intranet (a site restricted to users inside an organization) or an extranet (a site restricted to select users outside an organization). If an organization needs to present extensive amounts of data in particular formats, complete with strong database linkages, XML offers a solution. From an extranet standpoint, organizations can make their information available to clients through XML browsers, and entire industries can band together to produce an XML standard for information presentation.

XML is also much better than HTML at drawing data from heterogeneous database types and displaying that data in a consistent format. Of course, SGML already makes all of this possible, but XML is easier to use and faster to implement.

The first high-profile application of XML will be Microsoft's Channel Definition Format (CDF), included in Internet Explorer 4.0. Microsoft has based CDF on XML standards, and you can see the DTD at [www.microsoft.com/standards/cdf.htm](http://www.microsoft.com/standards/cdf.htm). This DTD shows the value of XML quite clearly: Microsoft has defined the XML elements specifically for push technology, with element names such as channel, item, schedule, and tracking. The push providers need only fit their data to the appropriate element types and their applications will be consistent with IE 4.0's display capabilities. This is the kind of standardization that just can't be achieved with HTML. 

Neil Randall is the author of *The Soul of the Internet (ITCP)* and coauthor of *Special Edition Using Microsoft FrontPage*.



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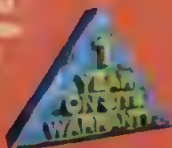
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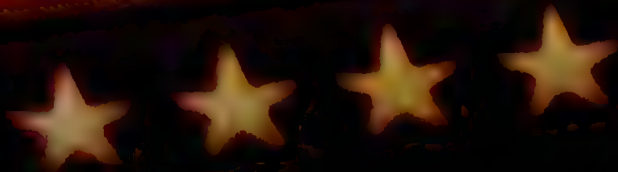


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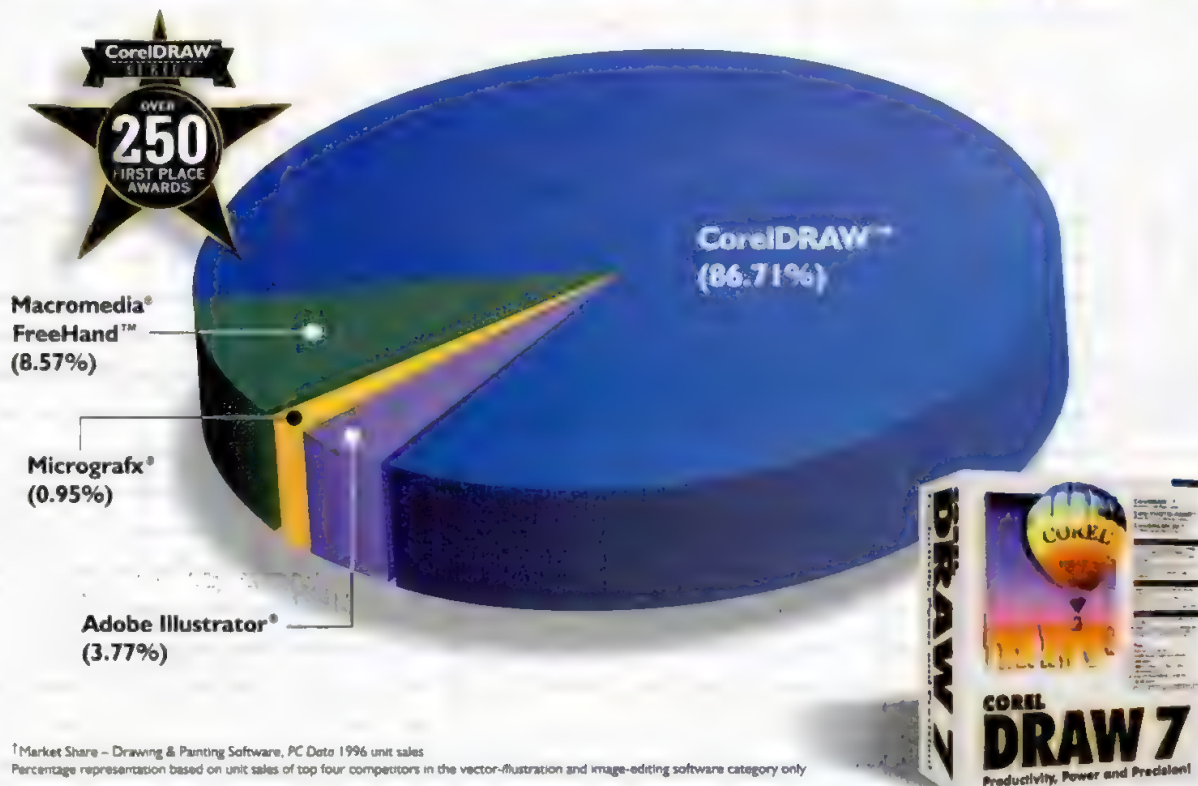


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## RoboType Means Less Typing for You

*You can add text macro expansion to almost any application running under Windows 95.*

By Gregory A. Wolking

**D**o you ever find yourself typing the same text over and over? Maybe you need to redirect e-mail inquiries to a different department, or maybe you like to use a standard sign-off or signature, but your e-mail program doesn't support that feature. Or maybe you'd like to be able to type a short descriptive name instead of a long URL.

This issue's utility, RoboType, saves keystrokes by letting you type short abbreviations in place of longer blocks of text. A few keystrokes or mouse clicks will expand an abbreviation. Many word processors include an auto-correct feature that can be used in this way; RoboType requires a few more keystrokes to use and is limited to text replacement, but it has one strong advantage. It can add its functionality to almost any application, including a text-mode application running in a DOS window.

You can obtain RoboType by downloading it from PC Magazine Online or by mail. Refer to the sidebar "Getting the Files" for details. The source code for RoboType, which was written with Microsoft Visual C++, is also available online for those interested in seeing how it works.

### USING ROBOTYPE

RoboType runs under both Windows 95 and Windows NT 4.0. To install the program, place its component files (Robotype.exe, Robotype.hlp, and Robotype.cnt) in the folder of your choice, then create a shortcut to Robotype.exe. Should you decide to remove RoboType from your system, use the Uninstall command on RoboType's System menu before you delete these files.

RoboType stores your abbreviations and associated expansions in library files and

automatically registers the document type with Explorer. To load your favorite RoboType library at system start-up, simply create a shortcut to the library in your Startup folder. RoboType allows only one instance of itself to be active at any time; if you attempt to launch RoboType again, it activates the current instance's main window. So a quick way to load a new RoboType library is to double-click on its icon.

By default, RoboType launches with its main window hidden, leaving only its icon in the system tray. To activate the main window,

## RoboType

*RoboType saves keystrokes by letting you type short abbreviations in place of longer blocks of text. A few keystrokes or mouse clicks will expand an abbreviation. RoboType is a 32-bit application that runs under Windows 95 or Windows NT 4.0.*



double-click on the tray icon. Right-click on the tray icon to activate a pop-up menu, from which you can activate the window, load a library, change certain settings, or exit the program. Note that closing the main window does not exit the program; it just hides the window. To exit the program, you must use the Quit command, from either the tray icon's pop-up menu, the File menu, or the System menu.

### CREATING LIBRARIES

Along with the usual menus, toolbar, and status bar, RoboType's main window (see Figure 1) contains two controls. The Abbreviation list box contains a sorted list of the abbreviations in the current library. The Replacement Text edit control shows the text that corresponds to the currently selected abbreviation. To create a new abbreviation, either select Add Abbreviation from the Edit menu, click the + button on the toolbar, or type Ctrl-A. Enter the desired abbreviation in the resulting dialog, then press Enter or click the OK button. Provided the abbreviation does not already exist, RoboType adds it to the list and installs the default text "New Abbreviation" into the Replacement Text control, ready for you to edit.

Your abbreviations can be as long or short as you wish, and they are not case-sensitive. The only restriction is that they cannot contain tabs or carriage returns. The replacement text for each abbreviation can contain up to 32,767 characters. Note that the Replacement Text control does not wrap lines; RoboType assumes that the target application will take care of word wrap. To insert explicit line breaks, use the Enter key. To insert tab characters, use Ctrl-I instead of the Tab key, which you use to navigate among controls in the window. Each library can contain up to 5,000 abbreviations.

As soon as your library contains at least one abbreviation, RoboType is ready to go to work. To replace an abbreviation, type it into the target application, select it, and copy it to the Clipboard. What happens next depends on the Auto Replace setting. When Auto Replace is enabled (as it is by default the first time you run the program), RoboType types your replacement text into the current window or control, just as if you had typed the text yourself. Auto Replace will work with any Windows application, but it won't work with DOS applications running in a window. When Auto Replace is disabled, RoboType puts your replacement text into the Clipboard and presents an audible prompt to let you know that it has done so. To complete the operation, use the application's Paste command to install your replacement text. Disabling

**FOR PROGRAMMERS ONLY** RoboType is a 32-bit application written in Microsoft Visual C++ 5.0 with MFC. The full source code for RoboType is available from PC Magazine Online and demonstrates the following programming techniques:

- creating a CFormView-based MFC application with self-adjusting dialog controls;
- using undocumented MFC functions to provide truly context-sensitive help;
- attaching to and using another application's message queue.

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Auto Replace lets you use the DOS window's frame controls to select and copy your abbreviation and to paste in your replacement text.

Note that when Auto Replace is disabled, RoboType may interfere with other Clipboard viewer applications, such as our own utility ClipAid. Although this interaction will not harm your system, it can be annoying. If circumstances are just right, RoboType and ClipAid can get stuck in a loop, constantly swapping two URLs back and forth in the Clipboard. If that happens, RoboType will still respond to your input, so you can break the loop by either disabling or quitting the program. This could happen with other Clip-

menu to change this behavior.

If the text you select includes a trailing carriage-return/line-feed (CR/LF) sequence, RoboType will still recognize your abbreviation, and when it installs your replacement text, it will automatically append a CR/LF to the text. This is actually a side effect made necessary by the way Windows treats text copied from a DOS window. Windows appends a CR/LF to each line in the block, even if the text is just a few characters from the middle of the line. RoboType's handling of this situation can be useful in other ways as well. If you have enabled processing of leading or trailing spaces, RoboType removes a trailing CR/

LF *before* it scans for trailing spaces and will restore the trailing CR/LF *after* restoring any trailing spaces, so these two functions will not interfere with each other.

In order to save or load your libraries to or from disk, use the standard File | Open, File | Save, and File | Save As commands.

The File menu also includes a Merge command to let you combine a library on disk with the one currently in memory. If an abbreviation in the library being merged already exists in the library in memory, RoboType will ask whether you want to replace the existing abbreviation.

## INSIDE ROBOTYPE

RoboType, which was written using Microsoft Visual C++ 5.0, presented a number of programming challenges. The highlights discussed here include how to create a CFormView-based MFC application with self-adjusting dialog controls, how to use undocumented MFC functions to provide true context-sensitive help, and how to attach to and use another application's message queue.

RoboType is a single-document interface (SDI) application with its one and only view class derived from CFormView. This means that the main window's client area is essentially a dialog box containing standard dialog controls. The first problem I ran into while developing the program was that MSVC's documentation doesn't tell you much about how to use the CFormView class, other than the fact that the form itself is taken from a standard dialog resource.

Laying out the dialog controls in the resource editor is straightforward enough, but the result is static. The controls appear exact-

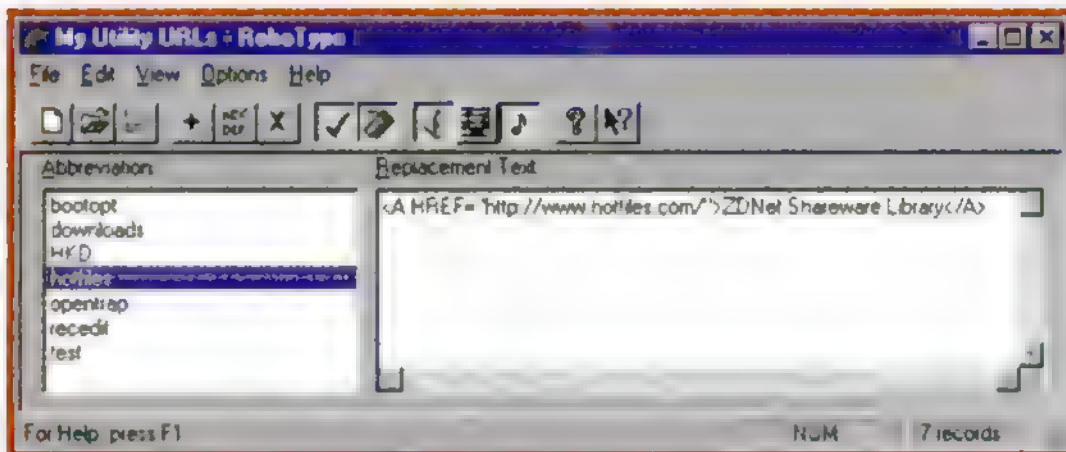
ly the same as they did in the resource editor, no matter how large or small the main window is. If the window is too small to show all of the controls, you get scroll bars on the main window to move the dialog around. Similarly, if the window is much larger than the original dialog layout, a user is left staring at acres of unused screen space.

This was not at all how I wanted RoboType to behave; I wanted RoboType's controls to rearrange themselves appropriately as a user resizes the window. The first step toward this end was to use the ClassWizard to create a member variable for each control on the form. For this to work properly, each control on the form must have a unique identifier assigned to it. The resource editor does this automatically for interactive controls, such as command buttons and check boxes, but not for static controls, such as labels and frames. Therefore, as you design your form, make sure you replace the default identifier (IDC\_STATIC) when you place any static controls on the form.

Once you have the form laid out in the resource editor, fire up the ClassWizard, select your View class in the Class Name list, and click the Member Variables tab. For each control on the form, double-click its identifier to bring up the Add Member Variable dialog. Enter a name for your member variable, then open the Category list, select Control, and click the OK button. This gives you a control-class member variable for each control on the form, so you can manipulate each control's window directly.

The next step is to modify the OnDraw handler (provided automatically by the AppWizard) in your View class. Your OnDraw handler must not attempt to access your controls before the MFC framework has linked them to their member variables. To avoid this situation, pick any one of your controls' member variables and test its m\_hWnd member. If this member contains NULL, just return from OnDraw without taking any further action. Once you verify that the controls exist, you can proceed to use the standard CWnd member functions to determine the size of your view's client area, then resize and reposition the controls appropriately using their member variables.

The next step is to get rid of the scroll bars, which are no longer necessary since the controls are self-adjusting. To do so, modify your view's OnInitialUpdate member function; the ClassWizard automatically creates an override for this function for you. Note that the ClassWizard's override automatically calls the default CFormView::OnInitialUpdate function. After this call, make a call to the parent



**FIGURE 1:** RoboType's main window displays the list of abbreviations you've defined on the left, with the text associated with the highlighted abbreviation on the right.

board viewers as well, so your libraries should not contain any chained abbreviations, especially if such a chain is circular—for example, when abbreviation *x* has replacement text *y*, and abbreviation *y* has replacement text *x*. RoboType automatically checks for chained abbreviations whenever you load or merge a library, but the program doesn't try to detect them as you edit your replacement text, because that would significantly slow performance. The Validate command on the File menu (keyboard shortcut: F5) lets you check for chained abbreviations at any time. Refer to the online help for the Validate command for further details.

Before RoboType begins searching for your abbreviation, it trims leading and trailing spaces from the text that you copied. If your abbreviation is found, RoboType will restore leading and trailing spaces to your replacement text before placing the text in the Clipboard. This makes it easier to work with applications that allow you to select an entire word with a single command. Most such programs will select any spaces that follow the target word as well as the word itself. In that situation, RoboType will maintain the same interword spacing when you replace an abbreviation, so you don't have to worry about entering leading or trailing spaces explicitly in your library. You can use the Advanced command on the Options





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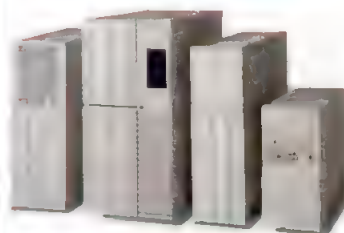
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window's `RecalcLayout` function to ensure that the MFC framework has initialized all of its internal data. Next, call the `SetScaleToFitSize` function. This tells the framework that you don't want scroll bars. Instead, you want it to resize your view to fill the frame window's client area. Note that for our purpose, the argument you pass to `SetScaleToFitSize` doesn't really matter; I used `SetScaleToFitSize(CSize(0, 0))`.

Finally, you'll need to prevent the user from shrinking your application's main window so small that your form controls either won't fit at all or would be too small to use. In order to accomplish this, use the ClassWizard to add a `WM_GETMINMAXINFO` handler to your `CMainFrame` class. Note that this handler receives one argument: `lpMMI`, which is a pointer to a `MINMAXINFO` structure. The ClassWizard automatically installs a call to the parent

`CFrameWnd::OnGetMinMaxInfo` function. Before the call to the parent class handler, insert a couple of statements using the `lpMMI` pointer to set the `ptMinTrackSize.x` and `ptMinTrackSize.y` elements of this structure to the desired minimum sizes.

## MFC AND CONTEXT HELP

One of the nice things about the AppWizard is that it creates a toolbar containing the context help button (a question mark with an arrow). Unfortunately, the button doesn't work—at least not in the way you might expect. The button gives you the help cursor, and the help cursor works as expected when you click on your toolbar buttons and other frame window controls. But it doesn't recognize individual controls on your form. No matter where you click within the form's client area, you get only the default help topic for the form itself. I was not at all happy with this, so it became my mission to get the help cursor working right.

To solve this problem, I had to trace through the MFC core code for the `CFrameWnd` class's `OnContextHelp` handler. This gave me a whole new appreciation for the MFC library—that handler is a very complex chunk of code! I finally determined that the parent frame searches for the help context by sending a private MFC message, `WM_HELPHITTEST`, to each child window it owns. The parent frame takes action based on the return value from this message as follows:

- Return value=0: Skip the current child window and continue the search with the next child window. If all child windows return 0, the frame uses the default help context for the entire application.
- Return value=-1: Stop searching and use the default help context for the entire application.
- Any other value: Stop searching and pass the value on to `WinHelp`.

The problem is caused by the fact that `CFormView::OnHelpHitTest` doesn't bother to determine at which control the user is pointing—it simply returns the default context ID for the entire form. To solve the problem, I had to override the `OnHelpHitTest` message handler (see Figure 2). Note that the ClassWizard doesn't list this message, so you have to declare the function and add the handler to your view class's message map manually. And since `WM_HELPHITTEST` is a private MFC message, you must be sure to include `<afxpriv.h>` to get the declaration for this message identifier, otherwise your code will not compile.

The `OnHelpHitTest` handler receives the standard `WPARAM` and `LPARAM` arguments common to all Windows message handlers. `WPARAM` is not used. `LPARAM` is a `DWORD` containing the

```
// First, the function declaration for your class's header file:
// Note that the function should be declared as a protected
// member of your view class. Do not place this declaration
// inside the Class Wizard's reserved block!

protected:
    afx_msg LRESULT OnHelpHitTest(WPARAM wParam, LPARAM lParam);

// Next, the macro for your view class's message map.
// Again, be sure to place this macro outside the Class
// Wizard's reserved block!

ON_MESSAGE(WM_HELPHITTEST, OnHelpHitTest)

// Finally, the function itself:

LRESULT CFormView::OnHelpHitTest(WPARAM wParam, LPARAM lParam)
{
    POINT point;
    CWnd * wnd;
    LONG id;

    // Extract mouse coordinates from lParam. Note that the
    // framework converts them from screen coordinates to client
    // coordinates before passing them to this function.
    point.x = LOWORD(lParam);
    point.y = HIWORD(lParam);

    // Get pointer to the window under the mouse pointer.
    wnd = ChildWindowFromPoint(point);
    // If function succeeded,
    if (wnd)
    {
        // And the mouse was not pointing at an open area of the form,
        if (wnd != (CWnd*) this)
        {
            // Get the control's identifier
            id = wnd->GetDlgCtrlID();
            // Adjust value for our help file and return it to caller.
            return id + 0x80000;
        }
    }
    // Otherwise, return the context ID for the form itself
    return 0x20000 + IDD_ROBOTYPE_FORM;
}
```



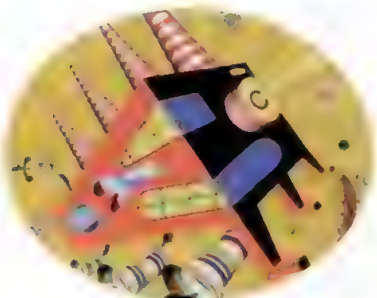
**FIGURE 2:** By overriding the undocumented MFC message handler `OnHelpHitTest`, *RoboType* can tell the help system at which control the user is pointing.



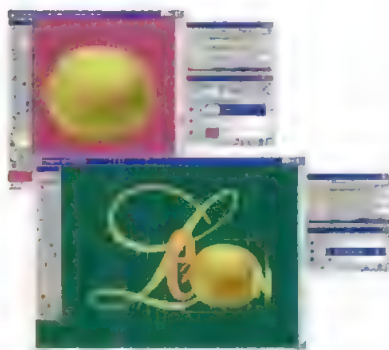
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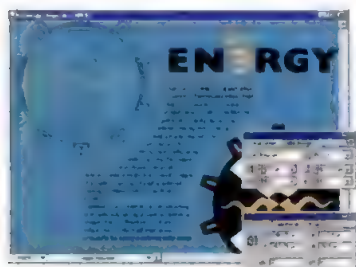
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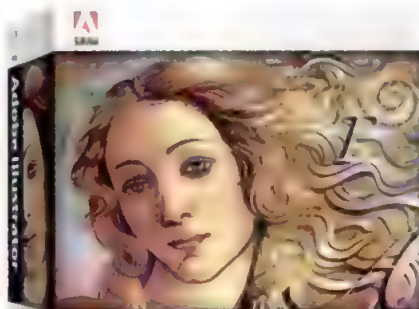
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When it comes to service and reliability, who's the one notebook maker you can truly count on? According to the nearly 8,500 people who responded to *PC Magazine's* 10th Annual Service and Reliability Survey, there is only one. (Impressive, considering they rated some 3,800 notebooks from 15 vendors, isn't it?) How did we earn the only "A"? Over the last year, our users reported better than average scores on four key measures: satisfaction with reliability, repair experience, and technical support; and the need for recent repairs. And this is a trend we're likely to continue with our new line of Dell® Inspiron™ notebooks. Visit us on the Web or give us a call.



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client coordinates of the help cursor, with the *x* coordinate in the low-order word and the *y* coordinate in the high-order word. After extracting those coordinates and copying them into a `POINT` structure, the handler calls `ChildWindowFromPoint` to determine which window the cursor is over. If the cursor is pointing at a control, it returns the identifier for that control. If the cursor is pointing at an open area of the form, it returns the identifier for the form itself.

## IMPLEMENTING AUTO REPLACE

RoboType uses the API function `SetClipboardViewer` to add itself into the Clipboard viewer chain, so it receives a notification message whenever the Clipboard's contents change. When that happens, RoboType makes a copy of the text and removes any leading or trailing spaces, keeping track of how many it has removed. It then scans through the current library to see if the text matches an abbreviation. If RoboType finds a match, it retrieves your replacement text and restores any leading or trailing spaces it stripped from your abbreviation.

The next step depends on the Auto Replace setting. If this setting is disabled, RoboType creates a global memory object

with the API call `GlobalAlloc`, then copies your replacement text to that object. It calls `EmptyClipboard` to delete the Clipboard's current contents, then calls `SetClipboardData` to pass ownership of the global memory object to the Clipboard, thus replacing your original abbreviation. Finally, Robo-

---

Using file-mapped  
memory allows  
multiple instances  
of RoboType  
to communicate with  
each other directly.

---

Type uses either `PlaySound` or `MessageBeep` (depending on which sound option you have set) to make its alert sound.

When Auto Replace is enabled, RoboType must determine which window you were working with, so that it can send your replacement text to that window in the form of a

series of `WM_CHAR` messages. The characters are sent by means of the *message queue*, through which Windows applications receive user input (mouse clicks, keystrokes, and so on). As an application receives each message, it removes the message from the queue so that the next message can be processed.

This procedure is more complicated under Windows 95 than it was under Windows 3.1, but it is also less prone to disaster. Under Windows 3.1, there is only one thread of execution and only one message queue common to all running applications. That means that if one application locks up and stops processing messages, all other running applications freeze, too, and the only recourse is to restart the system.

Under Windows 95, each running application has its own separate thread of execution with its own separate message queue. This isolates each application, so that if one locks up, others can continue to operate. That isolation also means one application normally cannot access another application's message queue, but fortunately there's a way to get around that. The work is done in `CMainFrame::DoAutoReplace`.

`DoAutoReplace` begins by calling `GetForegroundWindow` to determine the active window.

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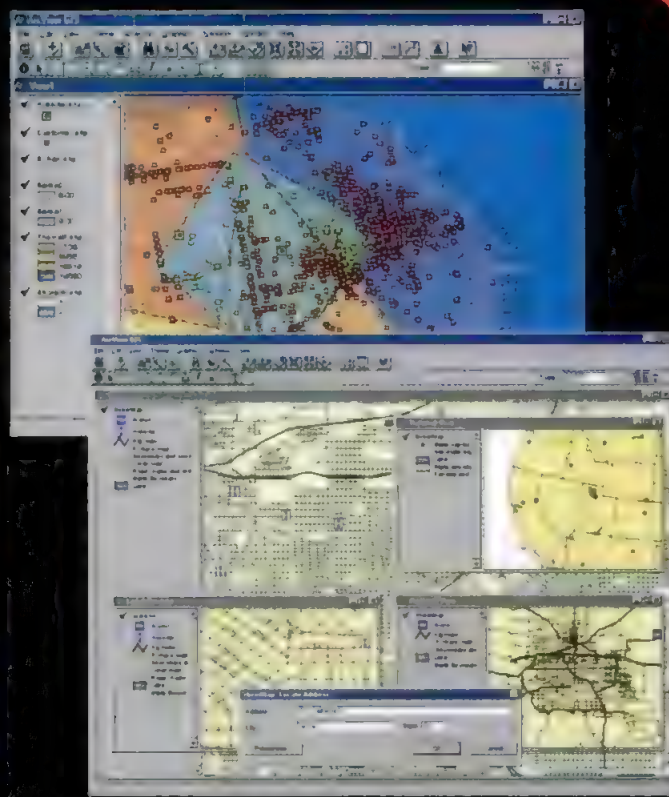
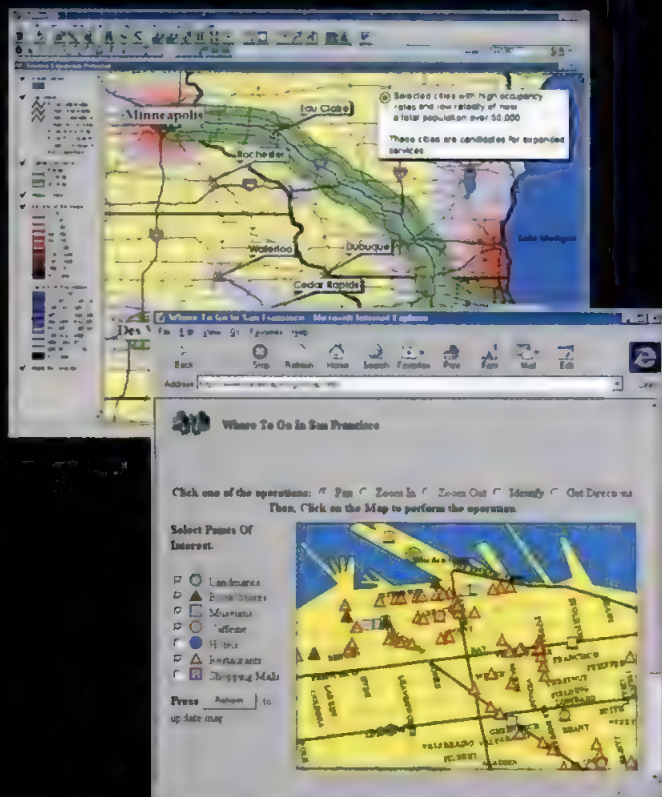
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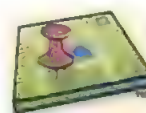
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Next, it calls `GetProcessThreadId` to get the identifier for that application's thread of execution, followed by `GetCurrentThreadId` to get the identifier of its own thread. It then compares those identifiers in case the active application is RoboType itself. If not, it calls `AttachThreadInput` to gain access to the target application's message queue.

The next step is to call `GetFocus` to determine which window in the target application has the keyboard focus. Note that the API call works differently under Windows 95 than under Windows 3.1. Under Windows 3.1, `GetFocus` always returns the window with the keyboard focus, regardless of which application owns the window. Under Windows 95, the separation of message queues means that `GetFocus` can return the keyboard focus window only if it belongs to the current process, unless you have attached to another process's message queue, as we just did. Otherwise, `GetFocus` returns `NULL`, unless one of the current application's windows has the keyboard focus.

Now that we've determined which window has the keyboard focus and gained access to its parent application's message queue, all that remains is to "type" our replacement text into that window by posting a series of `WM_CHAR` messages, one for each character in the text. The `while` loop strips out any line-feeds, because although the text control stores carriage returns as a CR/LF pair, Windows sees the Enter key as a single CR character. We also check before sending each message to insure that the target window still exists. That's important, because the target application can still process user input while RoboType is "typing," so it's possible for the user to close the target window manually. Another check is made as each `WM_CHAR` message is posted so that if something goes wrong and the tar-

get application freezes, we break out of the loop so we don't freeze along with it.

## MULTIPLE-INSTANCE HANDLING

The final hurdle to overcome was to provide a graceful way to handle multiple instances. It's not difficult to prevent multiple instances, but I wanted a more elegant solution than a message box saying, "RoboType is already running." In particular, I wanted to provide a way to let users switch libraries quickly and easily. To accomplish this, I used file-mapped memory to allow multiple instances of RoboType to communicate with each other directly.

When RoboType starts, it looks for a file-mapped object named RoboType Data. If this object doesn't exist, RoboType knows that it's the only instance running, so it creates the file-mapped object. The object itself contains a single structure containing two elements: the instance's window handle (`HWND`) and a character array. The first instance initializes both elements of the structure to `NULL`. When `CMainFrame::OnCreate` succeeds in creating RoboType's main window, it passes the window's handle back to `CRoboTypeApp::Save_Window_Handle`, which in turn stores the handle in the file-mapped object.

When you launch a second instance of RoboType, it retrieves and verifies the first instance's main window handle from the shared data. After calling `IsWindow` to ensure that the handle points to an existing window, it uses `SendMessage` to send the private message `WM_MY_VERIFY_ID` to that window. It tests the return value from `SendMessage` to make sure it's `0xABACAB`, as provided by `CMainFrame::On_My_Verify_ID`. Since the `WM_MY_VERIFY_ID` message lies within the `WM_USER` range, the chances of any other application's window responding to that message, let alone returning the ex-

pected value, are exceedingly slim.

Once the second instance has verified that the window handle points to the correct window, it looks at its command line to see if a filename is present. If not, it posts the `ID_TASKBAR_OPEN` command to the first instance, so it activates its main window just as if the user had selected the Open command from the tray icon's pop-up menu.

If a filename is on its command line, the second instance checks to make sure that the file actually exists. If the file doesn't exist, it presents an error message and quits. If the file does exist, the program copies the filename to the character array in the shared data object, then uses `PostMessage` to send another private message, `WM_MY_LOAD_FILE`, to the first instance's main window before shutting down. When the first instance handles the message, it retrieves the filename from the shared data and uses the filename to load the specified library.

## A FINAL WORD

Since RoboType doesn't use any system hooks or other "dirty tricks," it works with virtually any Windows application. I find it particularly useful when writing HTML code, something I do every day in my job as sysop for the *PC Magazine* Utilities forum on the Web. As you might have guessed from looking at the screen shot in Figure 1, whenever I need to give one of our users a link to a *PC Magazine* utility, I just type one word and let RoboType do the rest. I'm sure you'll find ways to let RoboType save you time and keystrokes, too. **PC**

*Gregory A. Wolking, the author of RoboType, is the primary sysop of the ZNT:TIPS Forum on ZDNet/CompuServe and the PC Magazine Utilities discussion area on the Web.*

*Sheryl Canter is the editor of the Utilities column and a contributing editor of PC Magazine.*

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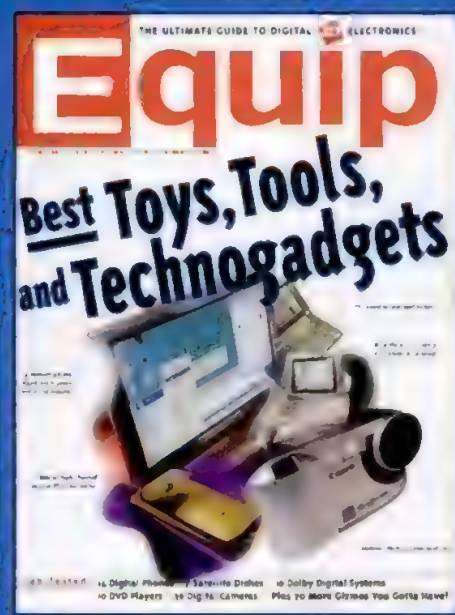
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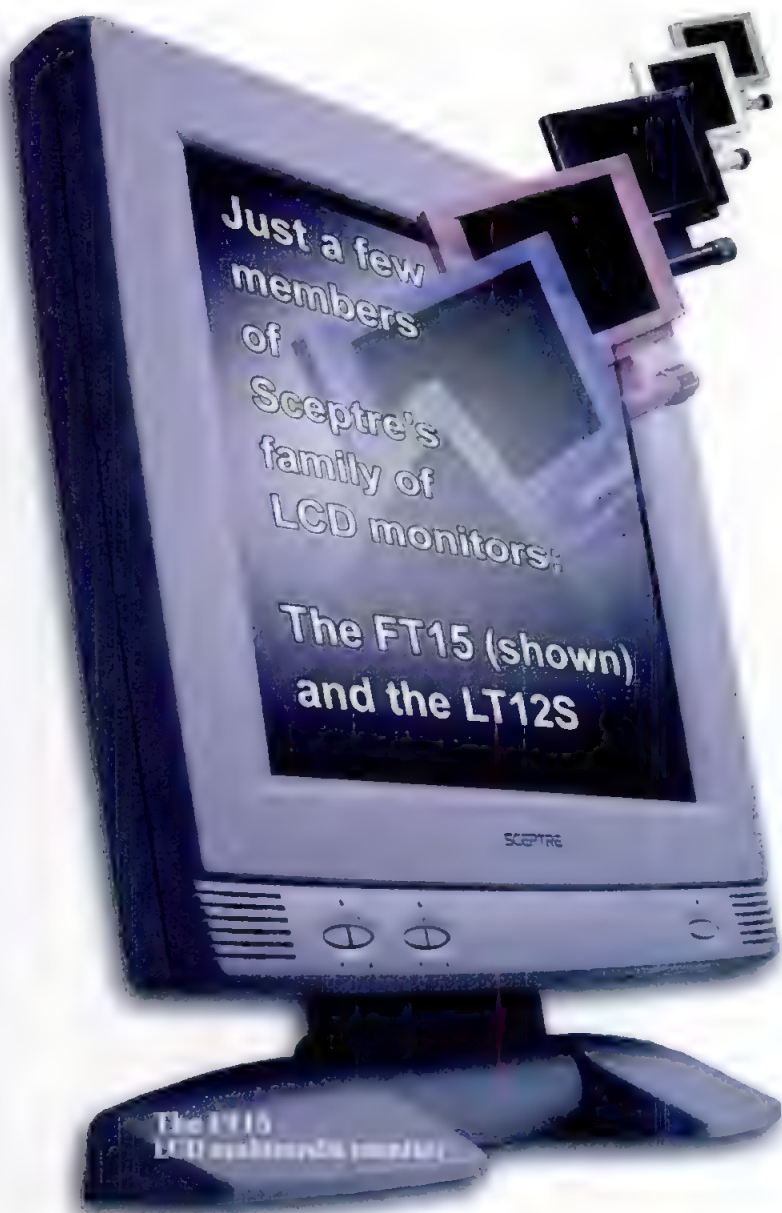
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# "Move Over, Norton, Enter Nuts & Bolts"

- Windows Sources, June 1997

## "Tops Norton's Utilities"

- PC Magazine, June 24, 1997

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- PC World, July 1997

| Feature                                         | NUTS & BOLTS | Symantec Norton Utilities™ |
|-------------------------------------------------|--------------|----------------------------|
| Fully integrated with Central Interface         | YES          | —                          |
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| Rebuild & Optimize Registry for max. speed      | YES          | —                          |
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| Clean up Hard Drive                             | YES          | YES                        |
| Provides Detailed System Info                   | YES          | YES                        |
| Emergency Rescue & Recovery                     | YES          | YES                        |
| Hardware Diagnostics                            | YES          | DOS only                   |
| System Monitor                                  | YES          | YES                        |
| Crash Recovery                                  | YES          | YES                        |
| Crash Protection                                | YES          | —                          |
| Easy System Configuration                       | YES          | YES                        |
| Zip/Unzip files                                 | YES          | —                          |
| Zip Integrated with file and Hard Drive Cleanup | YES          | —                          |
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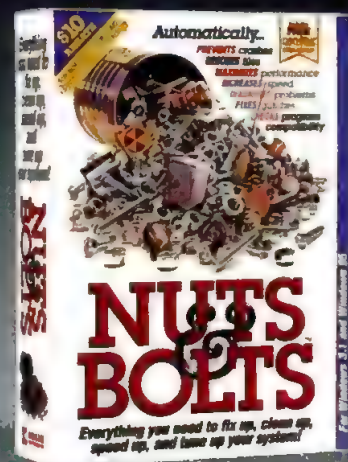
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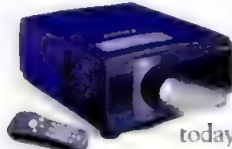
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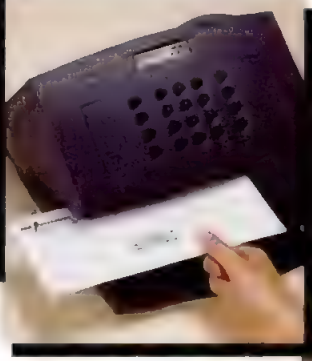
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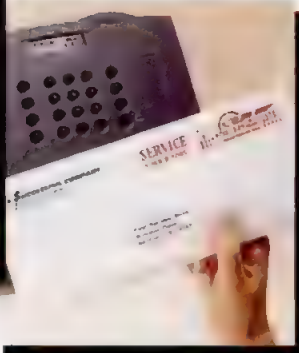
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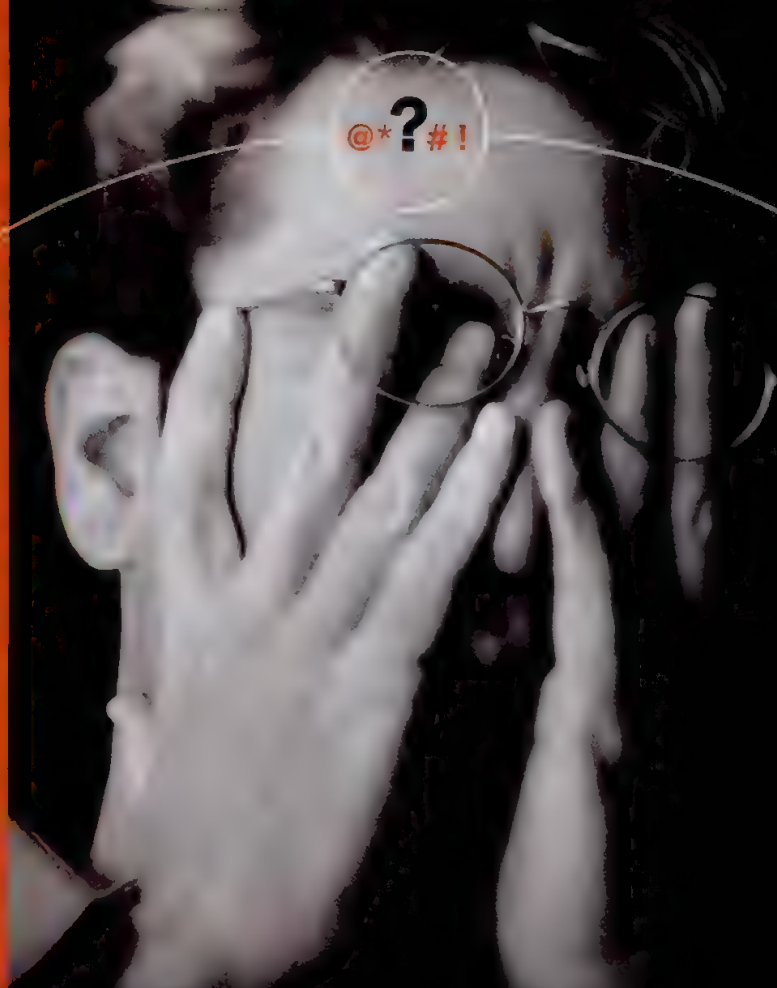


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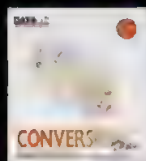
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# User-to-User

BY NEIL J. RUBENKING

## Automatically Remove Entries from the Registry

The file *Cleanmru.inf* (Figure 1) will remove many of the most recently used files, recent files, recent documents, history lists, and so on, that Windows 95 creates in your Registry. It also does the same for some other popular programs. If you look at the file with a text editor, you can see which Registry entries it will remove. You can use a text editor to add or delete entries, so you can adjust what will be removed from the Registry. Leaving in entries for items you don't have will do no harm (the file can't delete what doesn't exist). All of the keys that this .INF file deletes are self-creating and will return as needed.

If you want to delete just one value rather than a whole key, paradoxically you must add the key and value, with a special code. The example file removes several event-log values without removing the key that contains them. You can edit the lines in the [AddMe] section to remove different values.

In order to execute *Cleanmru.inf*, locate it

with Explorer, and double-click on it. If you've modified your associations for the .INF file type, then right-click on it and select the appropriate command (usually Run or Install). If you like, you can create a shortcut to the file in your Startup folder. The shortcut will run each time you start Windows 95 and delete the specified MRUs that were created in your previous session. As supplied, this file ends with a string of ten Ctrl-Z's. I have found that most .INF files execute faster if a few Ctrl-Z's are at the end of the file. These Ctrl-Z's will probably look like a string of little boxes at the end of the file; just leave them there.

ROY LEHRER

Montgomery, New York

**PC MAGAZINE:** Many of our readers write to ask how they can clear the various history lists, but this example .INF file is useful in and of itself. Especially valuable is the general technique for automating the deletion of Registry keys and values. The familiar technique of using .REG files breaks down here, as .REG files can only add new keys,

add new values, or modify existing values.

This reader's clever use of an .INF (information) file solves the problem. This type of file exists to support software installation; changing the Registry is just one of its many abilities. But unlike a .REG file, an .INF file can be used to delete keys and values. The .INF file's structure is similar to that of an .INI file, with data lines organized into sections whose names are contained in square brackets. A semicolon at the start of a line turns it into a comment, and blank lines are ignored, just as in an .INI file. The only significant difference is that some lines within the .INF file's sections consist of a series of parameters separated by commas, rather than the *key=value* format.

Deleting Registry keys is handled by the *DelReg=* line in the [DefaultInstall] section. The value of the *DelReg=* line is the name of another section in the .INF file (DeleteMe in this case), and keys listed in this section will be deleted.

Deleting individual values is a more complicated process; some might call it backward! To delete a Registry value using an .INF file,

```
; CLEANMRU.INF

; Deletes MRU (Most Recently Used) and other History
; lists from the registry

[version]
signature="$CHICAGO$"

[DefaultInstall]
DelReg=DeleteMe
AddReg=AddMe

; The [DeleteMe] section removes an entire key and ALL
; of its values
;
; Additions must use the format:
; MainRegistryKey,"SubKeyToDelete"
;
; Valid MainRegistryKey abbreviations are:
;         HKCR = Hkey_Classes_Root
;         HKCU = Hkey_Current_User
;         HKLM = Hkey_Local_Machine
;         HKU  = Hkey_Users
;

[DeleteMe]
HKCU,"Software\Microsoft\Cover Page Editor\Recent
```

```
File List"
HKCU,"Software\Microsoft\Developer\Recent File List"
HKCU,"Software\Microsoft\Excel\7.0\Recent File List"
HKCU,"Software\Microsoft\Excel\7.0\Recent File List"
HKCU,"Software\Microsoft\Fax Viewer\Recent File List"
HKCU,"Software\Microsoft\Internet Explorer\TypedURLs"
HKCU,"Software\Microsoft\Windows\CurrentVersion\Applets
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Explorer\PrnPortsMRU"
HKCU,"Software\Microsoft\Windows\CurrentVersion\
Explorer\RecentDocs"
HKCU,"Software\Microsoft\Windows\CurrentVersion\
Explorer\RunMRU"
HKCU,"Software\Microsoft\Windows\CurrentVersion\
Explorer\StreamMRU"
HKCU,"Software\Microsoft\Windows\CurrentVersion\
Explorer\Streams"
HKCU,"Software\Netscape\Netscape Navigator\URL
History"
```

(Continues)

**FIGURE 1:** This .INF file illustrates a technique for automating the process of deleting keys and values from the Windows 95 Registry.



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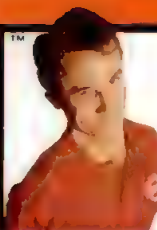
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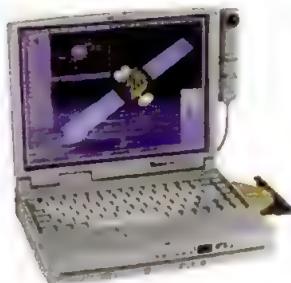
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| Mini-tower     | CPU                | RAM  | Hard drive | CD-ROM  | Price            | CDW   |
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| 5166X/3200     | 166MHz Pentium MMX | 32MB | 3.2GB      | -       | <b>\$1599.00</b> | 92845 |
| 5200X/2400     | 200MHz Pentium MMX | 32MB | 2.4GB      | -       | <b>\$1689.00</b> | 92847 |
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| 6233X/2400X    | 233MHz Pentium II  | 32MB | 2.4GB      | -       | <b>CALL!</b>     | 95921 |
| 6233X/3200X    | 233MHz Pentium II  | 32MB | 3.2GB      | 24X Max | <b>CALL!</b>     | 95922 |
| 6266X/3200X    | 266MHz Pentium II  | 32MB | 3.2GB      | 24X Max | <b>CALL!</b>     | 95924 |
| Mini-tower     | CPU                | RAM  | Hard drive | CD-ROM  | Price            | CDW   |
| 5166X/3200 CDS | 166MHz Pentium MMX | 32MB | 3.2GB      | 16X Max | <b>\$1799.00</b> | 92846 |
| 6233X/3200X    | 233MHz Pentium II  | 32MB | 3.2GB      | 24X Max | <b>CALL!</b>     | 95923 |
| 6266X/3200X    | 266MHz Pentium II  | 32MB | 3.2GB      | 24X Max | <b>CALL!</b>     | 95925 |

## Deskpro 4000 Series

Network-ready, optimal performance

■ Intel Pentium® MMX processors or Pentium II processors with MMX technology ■ 512KB Level 2 cache ■ 16MB or 32MB SDRAM ■ 2.4GB or 3.2GB S.M.A.R.T. Ultra ATA hard drives ■ CDS models include internal 16X Max (Pentium MMX models) or 24X Max (Pentium II models) EIDE CD-ROM drives and Enhanced Business Pro Audio ■ Integrated SVIRGE/GX (Pentium MMX models) or Matrox 1064SG (Pentium II models) enhanced 64-bit graphics controller with 3D acceleration ■ 2MB SGRAM standard, expandable to 4MB ■ Integrated Netelligent 10/100 TX Ethernet controller ■ Microsoft Windows® 95 (Pentium MMX models) or Windows NT Workstation V4.0 (Pentium II models) ■ 3-year parts, 1-year labor and on-site repair warranty



## Deskpro 6000 Series

Delivers performance and networking for the power user

■ Intel Pentium® II processors ■ 512KB Level 2 cache ■ 32MB or 64MB SDRAM standard, expandable to 384MB ■ 2.1GB or 4.3GB Ultra SCSI hard drives ■ CDS models include: internal 24X Max CD-ROM drives and 16-bit stereo audio ■ Matrox Millennium-II (AGP) graphics controller ■ 4MB WRAM standard, expandable to 16MB ■ Integrated 10/100 Ethernet controller ■ Operating system: Windows NT Workstation ■ Enhanced Intelligent Manageability ■ 3-year warranty parts; first year labor and on-site repair



## New models!

### Compaq Deskpro 6000 Series

| Desktop         | CPU               | RAM  | Hard drive | CD-ROM  | Price        | CDW   |
|-----------------|-------------------|------|------------|---------|--------------|-------|
| 6233X/2100X/CDS | 233MHz Pentium II | 32MB | 2.1GB      | 24X Max | <b>CALL!</b> | 95929 |
| 6266X/2100X/CDS | 266MHz Pentium II | 32MB | 2.1GB      | 24X Max | <b>CALL!</b> | 95930 |
| 6266X/2300/CDS  | 266MHz Pentium II | 32MB | 4.3GB      | 24X Max | <b>CALL!</b> | 95931 |
| 6300X/2300/CDS  | 300MHz Pentium II | 64MB | 4.3GB      | 24X Max | <b>CALL!</b> | 95933 |
| Mini-tower      | CPU               | RAM  | Hard drive | CD-ROM  | Price        | CDW   |
| 6266X/2300/CDS  | 266MHz Pentium II | 64MB | 4.3GB      | 24X Max | <b>CALL!</b> | 95932 |
| 6300X/2300/CDS  | 300MHz Pentium II | 64MB | 4.3GB      | 24X Max | <b>CALL!</b> | 95934 |

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## HP Brio Series PC

- Intel Pentium processors with MMX technology ■ 256KB or 512KB Level 2 pipeline burst cache (CDW 95060, 95061 only)
- 1MB video memory standard, expandable to 2MB (2MB std. CDW 95056 and 95060 only)
- Model 8178 includes Matrox Millennium II graphics controller with 4MB WRAM
- 1.6GB internal Travan tape backup drive (CDW 95059 only) ■ One USB port (mini-tower models only), two USB ports (tower models only)
- 3-year limited warranty



Monitor sold separately

### HP Brio Series PCs

| Mini-tower | CPU                | RAM std./max. | Hard drive | CD-ROM  | Modem   | Price            | CDW   |
|------------|--------------------|---------------|------------|---------|---------|------------------|-------|
| 8012       | 166MHz Pentium MMX | 16MB/128MB    | 2.1GB      | -       | -       | <b>\$999.63</b>  | 95050 |
| 8014       | 200MHz Pentium MMX | 16MB/128MB    | 2.1GB      | -       | -       | <b>\$1154.36</b> | 95052 |
| 9017       | 233MHz Pentium MMX | 32MB/128MB    | 3.2GB      | -       | -       | <b>\$1449.95</b> | 95053 |
| 8032       | 166MHz Pentium MMX | 16MB/128MB    | 2.1GB      | 16X Max | -       | <b>\$1149.54</b> | 95054 |
| 8034       | 200MHz Pentium MMX | 32MB/128MB    | 2.1GB      | 16X Max | -       | <b>\$1419.35</b> | 95055 |
| 8037       | 233MHz Pentium MMX | 32MB/128MB    | 3.2GB      | 24X Max | -       | <b>\$1649.54</b> | 95056 |
| Tower      | CPU                | RAM std./max. | Hard drive | CD-ROM  | Modem   | Price            | CDW   |
| 8172       | 166MHz Pentium MMX | 16MB/192MB    | 2.1GB      | 16X Max | 56K bps | <b>\$1379.29</b> | 95057 |
| 8174       | 200MHz Pentium MMX | 32MB/192MB    | 2.1GB      | 24X Max | 56K bps | <b>\$1635.54</b> | 95058 |
| 8175       | 200MHz Pentium MMX | 32MB/192MB    | 2.1GB      | 24X Max | 56K bps | <b>\$1749.63</b> | 95059 |
| 8177       | 233MHz Pentium MMX | 32MB/192MB    | 4GB        | 24X Max | 56K bps | <b>\$1869.90</b> | 95060 |
| 8178       | 233MHz Pentium MMX | 32MB/192MB    | 6GB        | 24X Max | 56K bps | <b>\$2117.37</b> | 95061 |

## IBM PC 300GL Series

A perfect combination of price and performance

Whether used as a single, stand-alone system or in a LAN environment, the IBM PC 300GL Series computers deliver the speed and solid functionality needed for off-the-shelf or customized applications. Features include Intel Pentium MMX processors, large-capacity 2.5GB hard drives, fast 64-bit PCI graphics and Windows 95 or Windows NT Workstation V4.0 on select models.

- Intel Pentium® processors with MMX technology ■ 256KB Level 2 cache
- SDRAM memory ■ Expansion slots: one ISA slot, one PCI slot, two shared ISA/PCI slots ■ Four bays (two available) ■ 1-year on-site limited warranty; 3-year parts warranty



Monitors sold separately

### IBM PC 300GL Series

| CPU                 | RAM  | Hard drive | CD-ROM | Price            | CDW   |
|---------------------|------|------------|--------|------------------|-------|
| 166MHz Pentium MMX  | 16MB | 2.5GB      | -      | <b>\$1179.37</b> | 89298 |
| 166MHz Pentium MMX  | 32MB | 2.5GB      | -      | <b>\$1299.00</b> | 94858 |
| 200MHz Pentium MMX  | 32MB | 2.5GB      | -      | <b>\$1459.74</b> | 95162 |
| 166MHz Pentium MMX* | 32MB | 2.5GB      | 16X    | <b>\$1599.00</b> | 89296 |

\*Includes Windows NT Workstation V4.0

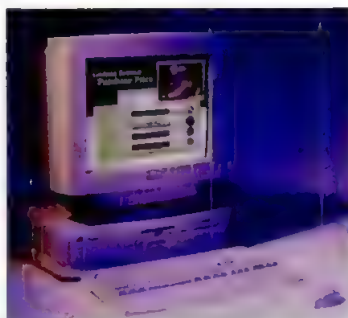


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## TOSHIBA Equium Series PCs

The Toshiba Equium series is designed to lower the total cost of PC ownership while providing stability of components, reliability and a rich feature set of



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relevant technology. All systems feature Intel Pentium processors, Universal Serial Bus, 12X, 16X or 24X CD-ROM, 3D video, a Windows® 95 keyboard and a three-button mouse. All systems are DMI 2.0 compliant and include Intel's LANdesk Client Manager software. It's everything you need in a personal computing solution and more.

### Toshiba Equium systems

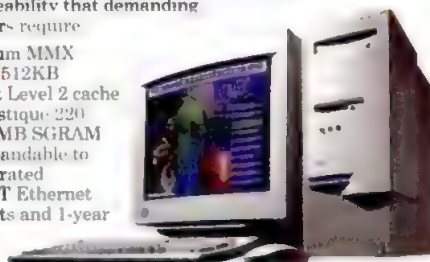
| Desktop    | CPU                | RAM  | Hard drive | CD-ROM | Price            | CDW   |
|------------|--------------------|------|------------|--------|------------------|-------|
| 6200D      | 200MHz Pentium Pro | 32MB | 2.95GB     | 12X    | <b>\$2118.80</b> | 84251 |
| 5230D      | 233MHz Pentium MMX | 32MB | 3GB        | 24X    | <b>\$1798.36</b> | 95209 |
| 6230D      | 233MHz Pentium Pro | 32MB | 3GB        | 24X    | <b>\$2199.43</b> | 95208 |
| Mini-tower | CPU                | RAM  | Hard drive | CD-ROM | Price            | CDW   |
| 6200M      | 200MHz Pentium Pro | 32MB | 4.24GB     | 12X    | <b>\$2479.47</b> | 84252 |
| 6260M      | 266MHz Pentium II  | 32MB | 3.73GB     | 16X    | <b>\$2569.07</b> | 93106 |

## IBM PC 300PL Series

The new IBM PC 300PL Series provides the additional performance, expandability and ease of serviceability that demanding computer users require

- Intel Pentium MMX processors ■ 512KB pipeline burst Level 2 cache
- Matrox Mystique 220 graphics ■ 2MB SGRAM standard, expandable to 4MB ■ Integrated 10/100BASE-T Ethernet
- 3-years parts and 1-year labor limited warranty

**New!**



### IBM PC 300PL Series

| Desktop            | RAM  | Hard drive | CD-ROM | Price            | CDW    |
|--------------------|------|------------|--------|------------------|--------|
| 200MHz Pentium MMX | 32MB | 2.5GB      | -      | <b>\$1589.34</b> | 94012  |
| 200MHz Pentium MMX | 32MB | 4.2GB      | -      | <b>\$1719.77</b> | 94013  |
| 200MHz Pentium MMX | 32MB | 4.2GB      | 24X    | <b>\$1856.20</b> | 94014  |
| 233MHz Pentium MMX | 32MB | 4.2GB      | -      | <b>\$1899.77</b> | 95760  |
| 233MHz Pentium MMX | 32MB | 4.2GB      | 24X    | <b>\$2069.54</b> | 95759  |
| Mini-tower         | RAM  | Hard drive | CD-ROM | Price            | CDW    |
| 166MHz Pentium MMX | 32MB | 2.5GB      | -      | <b>\$1479.23</b> | 95762  |
| 200MHz Pentium MMX | 32MB | 4.2GB      | 24X    | <b>\$1879.77</b> | 95763  |
| 233MHz Pentium MMX | 32MB | 4.3GB      | 24X    | <b>\$2469.56</b> | 95764* |

\*Windows NT Workstation V4.0, Ultra SCSI hard drive



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Designed to meet the unique needs of self-supported workgroups, the HP NetServer E40 and E45 deliver true server performance and superior dependability at the price of a desktop PC.

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- Internal expansion slots: two PCI, two ISA, two shared PCI/ISA
- Six expansion bays (four available)
- 1-year onsite warranty

*New!*



### HP NetServer E40 and E45

| E40   | RAM  | Hard drive | CD-ROM | Ethernet   | Price                | CDW   |
|-------|------|------------|--------|------------|----------------------|-------|
| 6/180 | 16MB | 2.1GB      | 8X     | 10/100Mbps | <del>\$1999.50</del> | 91478 |
| 6/200 | 32MB | 2.1GB      | 8X     | 10/100Mbps | <del>\$2265.63</del> | 91480 |
| E45   | RAM  | Hard drive | CD-ROM | Ethernet   | Price                | CDW   |
| 6/233 | 32MB | 4.2GB      | 24X    | 10/100Mbps | <del>\$2598.12</del> | 95404 |
| 6/266 | 32MB | 4.2GB      | 24X    | 10/100Mbps | <del>\$2898.02</del> | 95405 |



## Seagate Backup Exec for Windows NT V7.0

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Seagate Backup Exec™ for Windows NT is the system of choice for high-performance, reliable Windows NT data protection—and the most comprehensive solution for 100% BackOffice compatibility. As the first backup solution designed for Windows NT, Backup Exec incorporates the Windows NT APIs for superior 32-bit performance and ease-of-use. And, Seagate Backup Exec's Intelligent Disaster Recovery™ option provides the only diskette-based "point-in-time" recovery option that eliminates the need to reload the operating system first. This powerful feature gets you back online fast by allowing you to restore from your last backup set—including differential and incremental backups. In the event of a system or hardware failure, only Backup Exec combines the performance, reliability and flexibility to maximize data recovery you can depend on.



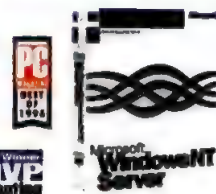
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| Enterprise edition*    | <b>\$858.91</b> | CDW 94890 |
| Single-server edition* | <b>\$429.88</b> | CDW 94889 |
| Exchange agent         | <b>\$429.88</b> | CDW 94893 |
| NetWare agent          | <b>\$429.88</b> | CDW 94895 |
| SQL Server agent       | <b>\$429.88</b> | CDW 94892 |
| Autoloader Module      | <b>\$367.98</b> | CDW 94891 |

\*Must register product to receive free IDR. Registration details inside box. Offer valid through 12/31/97

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| Server + 10 clients               | <b>\$1006.40</b> | CDW 73222 |
| Upgrade + 5 client licenses       | <b>\$365.77</b>  | CDW 73214 |
| Upgrade + 10 client licenses      | <b>\$485.83</b>  | CDW 73218 |
| Comp upgrade + 5 client licenses  | <b>\$365.77</b>  | CDW 73215 |
| Comp upgrade + 10 client licenses | <b>\$485.83</b>  | CDW 73217 |
| Single client license, upgrade    | <b>\$15.52</b>   | CDW 73209 |
| Single client license             | <b>\$29.96</b>   | CDW 73211 |



## EtherFast 10/100 PC Card

- Autosenses 10BT or 100BTX ■ Full duplex (autosensing) ■ Hot swappable—insert or remove card without powering down ■ 32K buffer for fast file and graphics transfers ■ Logo-certified with Windows 95, Windows NT and NetWare ■ 5-year limited warranty



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CDW 94392

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| Combo PC/LAN Card     | <b>\$69.57</b>  | CDW 42202 |
| PC Card Reader/Writer | <b>\$109.40</b> | CDW 67165 |

## EtherFast 4-port 100BASE-TX stackable hub

The new 4-port 100BASE-TX stackable hub is the ideal solution for a cost-effective move into Fast Ethernet. With built-in expandability, you can add more ports as business demands. Stack up to two hubs high using the stacking cable that's included. Uplink port provides access to other hubs and switches.



**\$179.71**  
CDW 81908

|                              |                 |           |
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| 100BTX 8-port stackable hub  | <b>\$449.00</b> | CDW 92065 |
| 100BTX 10-port stackable hub | <b>\$509.16</b> | CDW 92067 |
| 100BTX 16-port stackable hub | <b>\$536.12</b> | CDW 96605 |
| 5-port workgroup hub         | <b>\$49.24</b>  | CDW 57807 |
| 10-port workgroup hub        | <b>\$88.19</b>  | CDW 70377 |
| 20-port workgroup hub        | <b>\$159.94</b> | CDW 75530 |
| 16-port enterprise hub       | <b>\$204.25</b> | CDW 54746 |

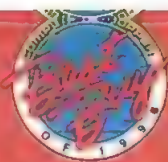
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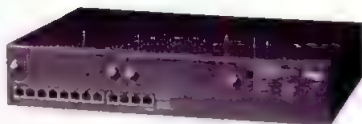


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24-port..... **\$1607.30** CDW 87165

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Network management module..... **\$1227.74** CDW 67313

100BASE-FX fiber uplink module..... **\$389.92** CDW 67312

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- Includes 256KB write-back Level 2 cache
- 32MB ECC RAM standard expandable to 512MB
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- Internal expansion slots: one shared PCI/ISA; four PCI; two ISA
- Six expansion bays: three or four available (depending on configuration)
- Includes: PCI Wide Ultra SCSI hard drive controller
- 3-year warranty



#### IBM PC Server 315

| CPU                | RAM  | Hard drive | CD-ROM | Ethernet   | Price            | CDW   |
|--------------------|------|------------|--------|------------|------------------|-------|
| 200MHz Pentium Pro | 32MB | —          | 8X     | —          | <b>\$2399.63</b> | 89310 |
| 200MHz Pentium Pro | 32MB | 2 1GB      | 8X     | 10/100Mbps | <b>\$2799.96</b> | 89311 |

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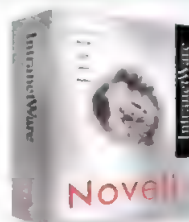
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- Distribute the NDS database through partitioning and replication
- Manage NetWare 3, NetWare 4, and IntranetWare servers using a single utility
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50 Network User Kit..... **\$3389.35** CDW 95458

100 Network User Kit..... **\$4728.48** CDW 95459

250 Network User Kit..... **\$8129.42** CDW 95859

5-user..... **\$739.47** CDW 75733

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| Server + 10-client license CD   | 1006.40 |
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| Novell                                                             |         |
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| IntranetWare                                                       |         |
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| 50-user CD                                                         | 3305.47 |
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| Server with 5 licenses                                             | 598.63  |
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| 3C509B-TPC EtherLink III coax ISA         | 69.45  |
| 3C905-TX Fast EtherLink XL 10/100 PCI     | 88.46  |
| 3C900-TPO EtherLink XL 10BT PCI           | 81.46  |
| 3C900-COMBO EtherLink XL PCI combo        | 129.44 |
| 3C589-TPO EtherLink III LAN PC Card 10BT  | 129.68 |
| 3C662D-TP EtherLink III 33.6 PC Card 10BT | 259.25 |
| OfficeConnect 4-port hub                  | 68.46  |
| SuperStack II Hub 7568112-port 10BT       | 499.49 |
| OfficeConnect 8-port hub                  | 81.69  |
| SuperStack II Hub 24-port 10BT            | 859.58 |

| FastHub                                |         |
|----------------------------------------|---------|
| FastHub 104T 4-port 100BTX hub         | 487.68  |
| FastHub 108T 8-port 100BTX hub         | 768.64  |
| FastHub 216T 16-port Fast Ethernet hub | 1839.48 |
| 2501 Ethernet dual serial router       | 1737.25 |
| 788 ISDN access router                 | 609.89  |

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| HP JetDirect 150X print server             | 167.98 |
| HP JetDirect 10/100BT print server card    |        |
| internal                                   | 399.49 |
| HP JetDirect 100BT                         | 307.04 |
| HP JetDirect EXPlus print server external  | 289.40 |
| HP JetDirect EXPlus3 print server external | 389.78 |

| IBM PC Server 310                 |         |
|-----------------------------------|---------|
| 5/200 32MB no hdd 8X CD           | 2098.86 |
| 5/200 32MB 2 1GB 8X CD            | 2465.91 |
| IBM PC Server 315                 |         |
| 6/200 32MB no hdd 8X CD           | 2389.83 |
| 6/200 32MB 2 1GB 8X CD            | 2799.98 |
| IBM PC Server 330                 |         |
| 6/200 32MB ECC optional hdd 8X CD | 4779.40 |
| 6/200 32MB ECC 2x2 25GB 8X CD     | 7668.69 |

| EtherExpress PRO 100 PCI                 |         |
|------------------------------------------|---------|
| NetPort Express PRO/100                  | 375.66  |
| Express 10/100 Fast Ethernet switch      | 1969.30 |
| Express 10/100 Fast Ethernet 12-port hub | 999.00  |

| LINKKEYS                        |        |
|---------------------------------|--------|
| StackPro 100 10-port 100BTX hub | 449.00 |
| StackPro 100 10-port 100BTX hub | 509.16 |
| Combo Ether16 LAN card          | 34.81  |
| Combo EtherPCI LAN card         | 49.24  |
| Combo PC/Ethernet card 10BT     | 99.57  |
| EtherFast 2-port 10/100 switch  | 264.43 |
| 10BT 5-port workgroup hub       | 49.24  |

### NETWORKING PRODUCTS

| NETGEAR                                 |        |
|-----------------------------------------|--------|
| 10/100 Fast Ethernet PCI adapter        | 49.73  |
| EN104 4-port 10BT slimline Ethernet hub | 63.25  |
| EN108 8-port 10BT slimline Ethernet hub | 84.60  |
| FE104 4-port 100BT Fast Ethernet hub    | 179.02 |
| FE108 8-port 100BT Fast Ethernet hub    | 358.87 |

| Netscape Communicator Std Edition |       |
|-----------------------------------|-------|
| Netscape Communicator             | 44.43 |
| Professional Edition              | 58.86 |

| SMC                                |        |
|------------------------------------|--------|
| EtherEZ 5T 10BT hub                | 59.69  |
| EtherEZ 16TC 10BT hub              | 188.88 |
| EtherEZ 10BT ISA                   | 29.58  |
| EtherPower 10/100 Card Bus PC Card | 158.45 |
| EtherPower II 10/100 PCI           | 78.60  |
| TigerStack 12-port TA hub          | 419.50 |
| TigerStack 26-port TA hub          | 859.21 |

| DATA STORAGE                  |        |
|-------------------------------|--------|
| Imaging                       |        |
| Zip drive 100MB parallel      | 149.95 |
| Zip drive 100MB external SCSI | 149.95 |
| Zip drive 100MB internal SCSI | 149.95 |
| Jaz drive 1GB internal SCSI-2 | 299.95 |
| Jaz drive 1GB external SCSI-2 | 399.95 |
| Ditto drive 2GB internal      | 149.95 |
| Ditto drive 2GB external      | 199.95 |
| Ditto Dash Card               | 59.95  |
| Ditto 3200MB Travan internal  | 146.72 |

| Quantum                     |        |
|-----------------------------|--------|
| Fireball ST 1.6GB Ultra ATA | 159.67 |
| Fireball ST 2.1GB Ultra ATA | 198.87 |
| Fireball ST 3.2GB Ultra ATA | 235.33 |
| Fireball ST 4.3GB Ultra ATA | 279.32 |
| Fireball ST 6.5GB Ultra ATA | 304.93 |

| Seagate          |         |
|------------------|---------|
| 1.2GB EIDE       | 149.66  |
| 2.1GB Fast ATA-2 | 177.84  |
| 2.1GB Ultra SCSI | 228.30  |
| 2.5GB Fast ATA-2 | 199.71  |
| 4.5GB Ultra SCSI | 827.53  |
| 9.1GB Ultra SCSI | 1029.01 |

| INPUT DEVICES                           |        |
|-----------------------------------------|--------|
| Alps GlidePoint Wave keyboard/touchpad  | 69.27  |
| Alps GlidePoint Windows 95 keyboard     | 96.10  |
| Casio QV-300 digital camera             | 668.34 |
| Connectix Color QuickCam V2.0           | 218.62 |
| Epson PhotoPC digital camera            | 248.64 |
| Epson PhotoPC 500 digital camera        | 399.00 |
| Epson ActionScanning System II          | 199.34 |
| Epson Expression 636 Exec scanner       | 799.00 |
| Hewlett Packard ScanJet 5e              | 199.58 |
| Hewlett Packard ScanJet 5p              | 297.08 |
| Hewlett Packard ScanJet 4cse            | 695.77 |
| Kensington Mouse-in-a-Box               | 27.29  |
| Kensington Expert Mouse V5.0 PS/2       | 95.83  |
| Kensington Orbik                        | 51.58  |
| Kodak DC50 Zoom Digital Camera          | 499.00 |
| Kodak DC120 Zoom Digital Camera         | 799.00 |
| Logitech Cyberman II game controller    | 68.39  |
| Logitech PageScan Color Pro             | 275.85 |
| Microltek Color PageWiz compact scanner | 158.21 |
| Microltek ScanMaker E3 color flatbed    | 174.56 |
| Nikon Coolpix 300 digital camera        | 574.04 |
| Play Snappy video still capture         | 139.15 |
| Ricoh RDC-2 digital camera              | 699.00 |
| UMAX Astra 600P scanner                 | 155.94 |
| UMAX Astra 600S scanner                 | 199.74 |
| UMAX Astra 1200S scanner                | 377.18 |
| Visiometer PaperPort mx scanner         | 149.28 |
| Visiometer PaperPort lx scanner         | 149.26 |
| Visiometer PaperPort Strobe scanner     | 249.99 |

### MINI/PCs

|                                     |         |
|-------------------------------------|---------|
| MAG Innovation 410V2 14" 0.28mm     | 209.50  |
| MAG Innovation 510V2 15" 0.28mm     | 298.44  |
| MAG Innovation 710V2 17" 0.28mm     | 495.26  |
| Magnavox MB4010 14" 0.28mm          | 199.07  |
| Magnavox MV5011 15" 0.28mm          | 257.16  |
| Magnavox MB7000 17" 0.28mm          | 479.96  |
| NEC MultiSync E500 15" 0.25mm       | 374.91  |
| NEC MultiSync E700 17" 0.25mm       | 659.18  |
| NEC MultiSync E1100 21" 0.25mm      | 1249.22 |
| NEC P750 17" 0.25mm                 | 785.92  |
| NEC P1150 21" 0.25mm                | 1388.76 |
| Princeton E050 15" 0.28mm           | 289.44  |
| Princeton E070 17" 0.28mm           | 469.36  |
| Princeton E090 19" 0.28mm           | 849.20  |
| Samsung SyncMaster 500s 15" 0.28mm  | 279.00  |
| Samsung SyncMaster 700s 17" 0.28mm  | 499.00  |
| Sony Multiscan 100ax 15" PnP 0.25mm | 329.00  |
| Sony Multiscan 200ax 17" PnP 0.25mm | 604.03  |
| Sony Multiscan 300ax 20" PnP 0.30mm | 1385.82 |
| ViewSonic E641 14" 0.28mm           | 205.81  |
| ViewSonic E655 15" 0.28mm           | 279.02  |
| ViewSonic G771 17" 0.27mm           | 524.50  |
| ViewSonic P815 21" 0.25mm           | 1429.71 |

### PC CARDS

|                                        |        |
|----------------------------------------|--------|
| 3Com LAN PC Card combo                 | 174.13 |
| 3Com 33.6 10BT LAN-modem               | 259.25 |
| 3Com 33.6 10BT LAN-modem combo         | 299.12 |
| 3Com 32-bit Fast EtherLink XL CardBus  | 147.57 |
| Hayes ACCURA 33.6 10BT Ethernet        | 299.91 |
| Hayes ACCURA 56K                       | 179.79 |
| Hayes OPTIMA 56K                       | 199.14 |
| Intel EtherExpress PRO/100             |        |
| 16-bit PC Card adapter                 | 149.89 |
| Intel EtherExpress PRO/100             |        |
| 32-bit Card Bus adapter                | 158.10 |
| Motorola Mariner 33.6                  | 359.16 |
| Motorola MobileSURFER 56K              | 179.03 |
| New Media PC Card joystick adapter     | 59.06  |
| Practical Peripherals 33.6             | 149.46 |
| Practical Peripherals 56K Fax cellular | 179.91 |
| Simple 33.6 cellular                   | 149.74 |
| Simple 33.6 Communicator w/SimpleJack  | 139.09 |
| Simple 56K Communicator                | 164.72 |
| U.S. Robotics Ethernet adapter w/KJACK | 109.06 |
| U.S. Robotics 33.6 cellular            | 239.00 |
| U.S. Robotics 33.6 cellular w/KJACK    | 229.95 |
| U.S. Robotics 33.6 w/KJACK             | 219.00 |
| U.S. Robotics 56K w/KJACK              | 229.20 |
| Xircor 33.6                            | 149.95 |
| Xircor 33.6 Ethernet 10BT              | 267.84 |
| Xircor 33.6 Ethernet combo             | 299.52 |

### MODEMS

| Hayes | |
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### COMPUTERS

#### TOSHIBA

|                                     |         |
|-------------------------------------|---------|
| Libretto mini-notebooks             |         |
| 50CT 5/75 16MB 772MB 6" 1" active   | 1929.45 |
| Satellite & Satellite Pro notebooks |         |
| 220CDS 5/133 16MB 1.34GB            |         |
| 12" dual 10X CD                     | 1899.13 |
| 440CDS 5/133 MMX 16MB 1.34GB        |         |
| 12" dual 10X CD                     | 1989.69 |
| 440CDS 5/133 MMX 16MB 1.34GB        |         |
| 12" active 10X CD                   | 2799.55 |
| 460CDS 5/166 MMX 32MB 2.02GB        |         |
| 12" active 10X CD                   | 3659.16 |
| Portege notebooks                   |         |
| 300CT 5/133 MMX 32MB 1.5GB          |         |
| 10.4" active                        | 3369.46 |
| 660CDS 5/150 16MB 1.2GB             |         |
| 11.3" active 10X CD                 | 3189.63 |
| Tecra notebooks                     |         |
| 510CDS 5/133 16MB 2.1GB             |         |
| 12" active 10X CD                   | 2659.78 |
| 520CDS 5/166 MMX 32MB 2GB           |         |
| 12" active 10X CD                   | 4159.45 |
| 530CDS 5/166 MMX 32MB 2GB           |         |
| 12" active 10X CD                   | 4579.17 |
| 730XCD 5/150 MMX 16MB 2GB           |         |
| 12" active 10X CD                   | 3499.77 |
| 740CDS 5/166 MMX 16MB 3GB           |         |
| 13" active 10X CD                   | 4659.23 |
| 740CDS 5/166 MMX 16MB 3GB           |         |
| 13" active 10X CD                   | 4849.62 |
| 750CDS 5/233 MMX 32MB 4.7GB         |         |
| 13.3" active 20X CD                 | 8449.23 |
| Infinia mini-towers                 |         |
| 7161 5/166 MMX 32MB 2.36GB 12X CD   | 1649.89 |
| 7201 5/200 MMX 32MB 3GB 12X CD      | 1969.24 |
| Equium desktops                     |         |
| 51600 5/166 MMX 32MB 2.1GB 12X CD   | 1418.82 |
| 52000 5/200 MMX 32MB 2.36GB 12X CD  | 1549.64 |
| 62000 6/200 32MB 3GB 12X CD         | 2118.80 |
| Equium mini-towers                  |         |
| 6200M 6/200 32MB 4.3GB 12X CD       | 2479.47 |
| 6260M 266MHz Pentium II 32MB        |         |
| 3.7GB 16X CD                        | 2889.07 |

#### ACER



|                             |         |
|-----------------------------|---------|
| Extensa notebooks           |         |
| 610CD 5/150 16MB 1.4GB      |         |
| 11"3" dual 10X CD           | 1954.67 |
| 610CDS 5/150 16MB 1.4GB     |         |
| 11"3" active 10X CD         | 2549.84 |
| 660CD 5/166 MMX 16MB 1.35GB |         |
| 12" dual 10X CD             | 2699.55 |
| 660CDS 5/166 MMX 16MB 2.1GB |         |
| 11"3" active 10X CD         | 3179.04 |
| TravelMate notebooks        |         |
| TM7060 5/166 MMX 32MB 2GB   |         |
| 12" active 10X CD           | 4299.59 |
| TM7063NT 5/166 MMX 32MB 3GB |         |
| 12" active 10X CD           | 4949.69 |

#### AST

|                           |         |
|---------------------------|---------|
| Ascendia notebooks        |         |
| A60+ 5/150 16MB 1.4GB     |         |
| 12" active 10X CD         | 2369.15 |
| A70+ 5/150 MMX 16MB 1.4GB |         |
| 12" active 10X CD         | 2489.84 |
| P70 5/150 MMX 32MB 2.1GB  |         |
| 12" active 10X CD         | 3148.94 |
| P80 5/166 MMX 32MB 3GB    |         |
| 12" active 10X CD         | 3568.98 |

### COMPUTERS

#### AST

|                                  |         |
|----------------------------------|---------|
| Bravo LC 6233 Series desktops    |         |
| 233MHz Pentium II 32MB 2GB Win95 | 2099.23 |
| 233MHz Pentium II 32MB 2GB WinNT | 2197.23 |
| Bravo MS Series desktops         |         |
| 5/166 MMX 32MB 2GB 16X CD        | 1619.87 |
| 5/200 32MB 2GB 16X               | 1549.10 |
| 5/200 32MB 3GB 16X CD            | 1487.26 |
| 5/200 MMX 32MB 3GB 16X CD        | 1696.69 |
| 5/200 MMX 32MB 3GB 16X CD        | 1799.25 |
| Ilirio MS-T Series mini-towers   |         |
| 5/166 32MB 3GB 16X CD            | 1616.14 |
| 5/200 32MB 3GB 16X CD            | 1564.09 |
| 5/200 32MB 3GB 16X CD            | 1649.08 |
| 5/200 MMX 32MB 3GB 16X CD        | 1779.77 |
| 5/200 MMX 32MB 3GB 16X CD        | 1879.98 |
| 6/200 32MB 2.5GB 8X CD           | 1866.33 |

#### COMPAQ

|                                      |         |
|--------------------------------------|---------|
| Armada notebooks                     |         |
| 1520MD 5/133 16MB 1GB                |         |
| 11.3" dual 10X CD                    | 1969.47 |
| 1530MD 5/133 MMX 16MB                |         |
| 1.4GB 12" dual 10X CD                | 2499.00 |
| 1550MDT 5/133 16MB 1.4GB             |         |
| 12" active 10X CD                    | 2999.00 |
| 1580MDT 5/150 MMX 16MB               |         |
| 2.1GB 12" active 10X CD              | 2499.00 |
| 4130T 5/133 16MB 1.08GB 11.8" active | 2497.23 |
| 4131T 5/133 16MB 1.4GB 12" active    | 2849.00 |
| 7710MT 5/150 MMX 16MB                |         |
| 1.6GB 12" 1" active                  | 2699.00 |
| 7730MT 5/166 MMX 32MB                |         |
| 2.1GB 12" 1" active                  | 4399.00 |
| 7750MT 5/166 MMX 32MB                |         |
| 2.1GB 12" 1" active                  | 4999.00 |
| Deskpro 2000 desktops                |         |
| 5133/1200 5/133 16MB 1.2GB           | 979.00  |
| 5133/2500 5/133 16MB 2.5GB           | 1089.00 |
| 5166X/2100 5/166 MMX 16MB 2.1GB      | 1169.00 |
| 5166X/3200 5/166 MMX 16MB 3.2GB      | 1219.00 |
| 5200X/2100 5/200 MMX 16MB 2.1GB      | 1319.00 |
| 5200X/3200 5/200 MMX 32MB 3.2GB      | 1489.00 |
| 5233X/3200CDS 5/233 MMX              |         |
| 32MB 3.2GB 16X CD                    | 1859.00 |
| Deskpro 2000 mini-towers             |         |
| 5166X/3200 5/166 MMX 16MB            |         |
| 3.2GB 16X CD                         | 1529.00 |
| 5200X/3200CDS 5/200 MMX 32MB         |         |
| 3.2GB 16X CD                         | 1679.00 |
| 6200/2500CDS 6/200 32MB 2.5GB 8X CD  | 2109.00 |
| Deskpro 4000 desktops                |         |
| 5166X/2400 5/166 MMX 16MB 2.4GB      | 1389.00 |
| 5166X/3200 5/166 MMX 32MB 3.2GB      | 1589.00 |
| 6233X/2500CDS 233MHz Pentium II      |         |
| 32MB 2.5GB 8X CD                     | 2319.00 |
| 6200X/3200 5/200 MMX 32MB 3.2GB      | 1689.00 |
| 5200X/3200 5/200 MMX 32MB 3.2GB      | 1759.00 |
| Deskpro 4000 mini-towers             |         |
| 5166X/3200CDS 5/166 MMX 32MB         |         |
| 3.2GB 16X CD                         | 1799.00 |
| Deskpro 6000 desktops                |         |
| 6233X/2150PDS 233MHz Pentium II      |         |
| 32MB 2.15GB                          | 2629.00 |
| 6266X/4200CDS 266MHz Pentium II      |         |
| 32MB 4.2GB 8X CD                     | 3179.00 |
| Deskpro 6000 mini-towers             |         |
| 6200/4200PDS 5/200 64MB 4.2GB        | 3099.00 |
| Presario desktops                    |         |
| 2200 5/180 16MB 1.6GB 8X CD          | 799.00  |
| Presario mini-towers                 |         |
| 4504 5/20016MB 2.1GB 16X CD          | 999.00  |
| 4814 5/233 MMX 32MB 6.5GB 24X CD     | 1999.00 |
| 4824 5/233 MMX 32MB 6.5GB 24X CD     |         |
| lomega Zip drive                     | 2399.00 |

### COMPUTERS

#### HEWLETT-PACKARD

|                                        |         |
|----------------------------------------|---------|
| HP OmniBook 500 Series notebooks       |         |
| 800CT 5/166 MMX 16MB 2GB 10.4" active  | 3679.68 |
| HP OmniBook 5700 Series notebooks      |         |
| 5/150 MMX 16MB 1.86GB 12" 1" active    | 3597.52 |
| 5/166 MMX 16MB 1.86GB 12" 1" active    | 4039.53 |
| 5/166 MMX 16MB 1.86GB 12" 1" active    | 4098.82 |
| 5/166 MMX 32MB 2.79GB 12" 1" active    | 4619.09 |
| HP Vectra VL Series 5 PC desktops      |         |
| 5/166 16MB 1.6GB                       | 1166.30 |
| 5/166 MMX 16MB 2.5GB 8X CD             | 1377.09 |
| 5/200 MMX 32MB 2.5GB 8X CD             | 1598.63 |
| 5/233 MMX 16MB 2.5GB                   | 1598.12 |
| HP Vectra VL Series 5 PC mini-towers   |         |
| 5/133 16MB 1.6GB                       | 1219.44 |
| 5/166 16MB 2.5GB                       | 1229.50 |
| 5/166 MMX 16MB 2.5GB 8X CD             | 1439.22 |
| 5/233 MMX 32MB 4GB                     | 1889.76 |
| HP Vectra VE Series 3 PC desktops      |         |
| 5/166 16MB 1.6GB                       | 1038.97 |
| 5/200 16MB 1.6GB                       | 1048.60 |
| HP Vectra 500 Series desktops          |         |
| 520MCx 5/166 16MB 1.6GB 16X CD         | 1327.84 |
| HP Vectra 500 Series mini-towers       |         |
| 525CD 5/166 16MB 1.6GB 16X CD          | 1234.78 |
| 525MCx 5/166 MMX 24MB 2.5GB 16X CD     | 1549.65 |
| 525CD 5/200 MMX 24MB 2.5GB 16X CD      | 1588.65 |
| 525MCx 5/200 MMX 32MB 2.5GB 16X CD     | 1936.70 |
| HP Brio Series mini-towers             |         |
| 5/166 MMX 16MB 2.1GB                   | 999.53  |
| 5/166 MMX 16MB 2.1GB 16X CD            | 1379.29 |
| 5/200 MMX 32MB 2.1GB                   | 1154.35 |
| 5/200 MMX 32MB 2.1GB 24X CD            | 1835.54 |
| 5/233 MMX 32MB 4GB 24X CD              | 1869.90 |
| 5/233 MMX 32MB 6GB 24X CD              | 2117.37 |
| HP NetServer E40 Series towers         |         |
| 6/180 16MB no hdd 8X CD                |         |
| 10/100 Ethernet                        | 1719.09 |
| 6/180 16MB 2.1GB 8X CD 10/100 Ethernet | 1999.58 |
| 6/200 32MB 2.1GB 8X CD 10/100 Ethernet | 2265.63 |

#### THINKPAD

|                                      |         |
|--------------------------------------|---------|
| ThinkPad notebooks                   |         |
| 380 5/150 16MB 1.08GB 12" 1" dual    | 1889.46 |
| 380D 5/150 16MB 1.35GB               |         |
| 12" 1" dual 8X CD                    | 1999.50 |
| 380D 5/150 MMX 16MB 2.1GB            |         |
| 12" 1" active 8X CD                  | 3069.76 |
| 580 5/133 8MB 2.1GB 11.3" dual       | 1699.89 |
| 580 5/133 8MB 2.1GB 12" 1" active    | 2849.32 |
| 560E 5/150 MMX 16MB 2.1GB 11.3" dual | 2599.86 |
| 560E 5/166 MMX 16MB 2.1GB            |         |
| 12" 1" active                        | 4186.28 |
| 760ED 5/133 16MB 2.1GB               |         |
| 12" 1" active 8X CD                  | 3739.72 |
| 780E 5/150 16MB 2.1GB 12" 1" active  | 3578.40 |
| 760XL 5/166 MMX 16MB 2.1GB           |         |
| 12" 1" active                        | 3769.88 |
| 760XD 5/166 MMX 32MB 3GB             |         |
| 12" 1" active 8X CD                  | 4679.37 |
| 765L 5/166 MMX 32MB 3GB 13.3" active | 5098.39 |
| 765D 5/166 MMX 32MB 3GB              |         |
| 13" 3" active 8X CD                  | 5499.91 |
| Active Series mini-towers            |         |
| C3E 5/233 MMX 32MB 4.2GB 16X CD      | 1939.05 |
| C3D 5/233 MMX 32MB 4.2GB 8X CD       | 2699.00 |
| S3C 5/233 MMX 32MB 4.2GB 16X CD      | 2299.00 |
| S3S 5/233 MMX 48MB 6.4GB 24X CD      | 2699.00 |

### COMPUTERS

#### FUJITSU

|                                     |         |
|-------------------------------------|---------|
| PC300XL Series desktops             |         |
| 233MHz Pentium II 32MB 2.5GB 16X CD | 2275.14 |
| 233MHz Pentium II 32MB 2.5GB        | 1895.36 |
| 266MHz Pentium II 32MB 4.2GB 16X CD | 2659.12 |
| 266MHz Pentium II 32MB 4.3GB 16X CD | 2494.24 |
| LifeBook 500 Series notebooks       |         |
| 555Tx 5/150 MMX 16MB 2GB            |         |
| 12" 1" active 10X CD                | 3499.00 |
| 565Tx 5/166 MMX 32MB 2GB            |         |
| 12" 1" active 20X CD                | 4299.00 |
| LifeBook 600 Series notebooks       |         |
| 635T 5/133 16MB 1.3GB 12" 1" active | 2799.00 |
| 655Tx 5/150 MMX 16MB 1.3GB          |         |
| 12" 1" active                       | 3799.00 |

#### HITACHI

|                                   |         |
|-----------------------------------|---------|
| VisionBook Plus Series notebooks  |         |
| 4140 5/133 16MB 1.4GB             |         |
| 12" 1" dual 10X CD                | 1799.00 |
| 4150x 5/150 MMX 16MB 1.4GB        |         |
| 12" 1" dual 10X CD                | 2299.00 |
| 4360x 5/166 MMX 16MB 1.4GB        |         |
| 12" 1" active 10X CD              | 2999.00 |
| VisionBook Pro Series notebooks   |         |
| 7340 5/133 MMX 16MB 1.4GB         |         |
| 12" 1" active 10X                 | 2999.00 |
| 7360 5/150 MMX 16MB 2.1GB         |         |
| 12" 1" active 10X CD              | 4399.00 |
| 7560 5/166 MMX 16MB 3GB           |         |
| 13" 3" active 10X CD              | 4799.00 |
| VisionBook Elite Series notebooks |         |
| 8560 5/166 MMX 16MB 2.1GB         |         |
| 13" 3" active 10X CD              | 4599.00 |

### HANDHELD PCs

|                                      |        |
|--------------------------------------|--------|
| Casio Casiopea A-11 4MB              | 484.13 |
| Hewlett-Packard 320LX PalmTop PC 4MB | 477.34 |
| Hewlett-Packard 320LX PalmTop PC 4MB | 499.14 |
| Philips Velo 1 4MB                   | 739.99 |
| U.S. Robotics PalmPilot Personal     | 286.98 |
| U.S. Robotics PalmPilot Professional | 377.99 |

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(Continued)

```
HKCU,"Software\Symantec\Internet FastFind\EasyZIP\Zip
History"
HKCU,"Software\Symantec\Internet FastFind\NetFileFind\
Search History"
HKCU,"Software\Symantec\Internet FastFind\WebFind\
Search History2"
HKCU,"Software\Symantec\Internet FastFind\WebFind\
Search History"
HKCU,"Software\Symantec\Navigator\FileAssist\History
Lists"
HKCU,"Software\Symantec\Navigator\FILEMGR\FMDirTree\Hist"
HKCU,"Software\Symantec\Navigator\SYMFDLG4\History_Lists"
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Registry Editor\Bookmark"
HKCU,"InstallLocationsMRU"
HKCU,"Software\BreakPoint\Hex Workshop\Recent File List"
HKCU,"Software\Caere\OmniPage7.0\OmniPage Pro for
Windows 95\Recent File List"
HKCU,"Software\Impact\Microangelo\Animator\MRU List"
HKCU,"Software\Impact\Microangelo\Engineer\MRU List"
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HKCU,"Software\Inso\Quick View Plus\CurrentVersion\Find
MRU"
HKCU,"Software\TechSmith\SnagIt\Recent File List"
HKCU,"Software\Quarterdeck\WebCompass\Recent File List"
```

you must *add* the value using the flag `FLG_ADDREG_DELVAL`, whose value is 4. That's why each line in the [AddMe] section of the example .INF file ends with a 4 and a comma. The line `AddReg=AddMe` in the [DefaultInstall] section of the example .INF file indicates that the system should process all the lines in the [AddMe] section as Registry additions.

If you want to experiment with removing Registry keys and values by using .INF files, first make a backup. Run RegEdit and navigate to the Registry branch you plan to modify. Then select Export from the Registry menu to create a .REG file defining that branch. If your experiment goes awry, you can restore the branch by importing that .REG file. To create your .INF file, make a copy of the example .INF file in Figure 1 and delete the contents of the [DeleteMe] and [AddMe] sections. Then enter your own replacement lines for these sections, using the format described in the example file's comments. Used with care, this technique can substantially ease the process of automating Registry changes.

## A Better Way to Search .CAB Files

*Your issue of April 22, 1997, presented the file `Extracab.bat`, which searched all the .CAB files in a directory to find a particular file. There is a simpler method that uses just the Extract command. Extract includes the `/A` switch, which allows the process to start at a designated cabinet file and continue through to the last in the series, searching for the file(s) specified.*

*For example, the command*

```
EXTRACT /A WIN95_02.CAB FILE.EXT
```

*will start at `Win95_02.cab`, search that file, and then increment the number by one and search again until it runs out of files. Of course, this line checks only `Win95_*.cab`, where most of the files are stored. You can substitute `Pre-copy1.cab` for `Win95_02.cab` to search the other files in the directory.*

```
: The [AddMe] section removes only the specified value
: from a key
:
: Additions must use the format: MainRegistryKey,
: "SubKey","ValueToDelete",4,
:
: Note: The trailing comma at the end of each entry
: is mandatory, and if
: missing will cause problems.
:
: Valid MainRegistryKey abbreviations are:
:
:         HKCR = Hkey_Classes_Root
:         HKCU = Hkey_Current_User
:         HKLM = Hkey_Local_Machine
:         HKU  = Hkey_Users
:
```

[AddMe]

```
HKCU,"Software\Symantec\Internet FastFind\Notify\
Default\Adaptec","EventLog0",4,
HKCU,"Software\Symantec\Internet FastFind\Notify\
Default\Adaptec","EventLog1",4,
HKCU,"Software\Symantec\Internet FastFind\Notify\
Default\Adaptec","EventLog2",4,
HKCU,"Software\Symantec\Internet FastFind\
Notify\Default\Adaptec","EventLog3",4,
HKCU,"Software\Symantec\Internet FastFind\
Notify\Default\Adaptec","EventLog4",4,
```



**PC MAGAZINE:** Who would have thought that the clunky old utility Extract would have such a clever feature built in? Indeed, in most cases this is a better solution than `Extracab.bat`. Do note, though, that you shouldn't enter the command precisely as shown in the reader's letter. That command would attempt to store the extracted file right on the Windows 95 CD. One solution is to run Extract from the desired destination directory and spell out the full pathname of the .CAB file:

```
EXTRACT /A H:\WIN95\WIN95_02.CAB
FILE.EXT
```

Another is to run Extract from the directory on the CD that contains the files, and to use the Extract command's `/L` switch to define the location in which to place extracted files:

```
EXTRACT /A WIN95_02.CAB FILE.EXT /L
C:\WINDOWS
```

Either method will work.

JOEL MATHIS  
Davie, Florida





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A black and white photograph of the EZFLYER 230MB removable drive. It is a small, rectangular device with a dark, possibly metallic, finish. A silver-colored metal sliding door is partially open, revealing the internal components, including a circular disk platter. The device is shown from a slightly elevated, angled perspective.

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[illegible]



# Ask Our Advisors

## HARDWARE

### Fouled-Up Floppy

*I have a floppy disk with some text files that I need to retrieve, but Windows 95 reports that the floppy is not formatted. Do you have any suggestions on how to retrieve the lost data?*

TOM SENSKE  
via the Internet

**PC MAGAZINE:** If you are certain that the data is on the floppy disk and that there is no other copy of this valuable data, your best bet may simply be to turn the project over to a professional data-recovery service.

If you want to try to retrieve the data yourself, then the first thing to do is to try the disk in several other computers. It is possible that the disk has been slightly damaged or was formatted on a drive that was performing at other than the standard specifications. By trying the floppy disk in different computers, you may find a drive that is out of adjustment in the same way and will be able to read the data. If you find a drive that can successfully read the old floppy, save the data to the system's hard disk. Then format a floppy on your system and see if you can copy the data from the other system to that disk; chances are that the other drive may be off by enough to read both the old and the new disks, even though the drive on your system can't. You could also try e-mailing the file to yourself.

Keep in mind that a floppy formatted for another type of computer, such as a Macintosh, will appear to be unformatted on a PC. You might want to try the disk in another type of machine before you give up on the data.  
—Alfred Poor

### Shuffling the Cards

*I am about to install a new graphics adapter card, which will replace the graphics circuitry that was integrated into the system's motherboard. I'm concerned, however, that the monitor won't be able to display anything until I install drivers for the adapter. Will it run in some kind of simple mode that allows me to see the display?*

KEVIN BOQUIST  
via the Internet

**PC MAGAZINE:** All graphics adapters capable of VGA modes power up in that mode by default. This is why you typically see standard VGA text on the screen during the computer's power-on self-test (POST). As most monitors

are also capable of displaying VGA signals, this start-up mode gives you the greatest chance of success. Virtually all monitors and graphics adapters made in the past ten years (since the introduction of the first IBM PS/2) are capable of handling VGA signals.

If you're running DOS, then you will have a VGA display to work with while installing the new graphics adapter's utilities and drivers. If you are running Windows 3.x, you can use the DOS version of the Windows Setup program to change the driver setting to the new card before you start Windows. Windows 95's Plug and Play feature should be able to identify the card automatically and load an appropriate driver, but if you want to play it safe, simply change the Windows 95 configuration to use the generic "Standard Display Adapter (VGA)" in the Display Properties window before you change to the new adapter.—Alfred Poor

### Pennies per Page

*Has anyone done a cost comparison as to printing large documents with laser printers versus dot matrix printers? My company currently prints out about 2,000 pages a week from a dot matrix. It would be more convenient to do so from our laser printers, but we don't know how often we'd end up changing the toner cartridges in them. Considering that a laser toner cartridge costs about 15 times as much as a dot matrix ribbon, it's not clear which is the better bargain.*

DOUG ALLEN  
via the Internet

**PC MAGAZINE:** There is no way to determine precisely how many pages you'll get from a single toner cartridge or printer ribbon, but you can make a pretty fair estimate.

The page yield per cartridge or ribbon depends on how much ink is put on each page. The industry standard estimates that a full page of typewritten text will cover about 5 percent of the page with ink. For most dot matrix printers, this coverage will cost less than a penny per page. For laser printers that use one-piece toner-and-drum cartridges, the cost tends to range from 2 to 3 cents per page. Laser printers with separate drums—especially the larger, faster models—tend to have lower per-page consumable costs, approaching a penny each page.

Assume for the moment, however, that the laser printer costs 2 cents per page and the dot matrix costs 1 cent per page. If the laser car-

tridge costs 15 times as much as a dot matrix ribbon but costs only twice as much per page, then you'll have to change the dot matrix ribbon 7.5 times for every laser cartridge change.

Furthermore, if you're printing only text, the laser printer will probably manage output speeds of 12 or so pages per minute. Dot matrix printers are typically rated in terms of characters per second, and they pass over blank space faster than where they print, but speeds of 3 to 5 pages per minute are typical for high-speed, heavy-duty units when printing in quality mode—and up to about 8 pages per minute in high-speed draft modes. As a result, the laser printer may finish the print job significantly faster while creating a better-quality product with less noise.

Paper-handling factors may be a toss-up. Pin-fed dot matrix printers can draw from a large box of tractor-feed paper, thus requiring less attention than a laser. If you're printing only 2,000 pages per week, however, that should not be a factor. On the other hand, if you currently need to strip the pin holes and burst and collate the tractor-feed paper from the dot matrix output, the cut-sheet laser output can save a significant amount of labor.

## OUR ADVISORS

**Alfred Poor** is a contributing editor and the author of *The Underground Guide to Hardware*.

**Brian Proffitt** is a contributing editor of *Computing Today* and the author of *OS/2 Warp Survival Kit*.

**Sal Ricclardi** is a contributing editor and the author of the *Running Fox-Pro* series from Microsoft Press.

**Neil J. Rubenking** is technical editor and author of *Delphi Programming for Dummies*.

**Luisa Simone** is a contributing editor and the author of *Microsoft Publisher by Design*.

**Craig Stinson** is a contributing editor and the coauthor of *Running Windows 3.1* and *Running Microsoft Excel*.

**M. David Stone** is a contributing editor and the coauthor of *Word for Windows Companion, Second Edition*.



# PCTech Ask Our Advisors

Hardware and supplies are relatively cheap compared with the cost of time and personnel resources in a typical company. A penny difference per page in supply costs for a laser printer is just \$20 per week when printing 2,000 pages. It is quite likely that the extra speed and reduced operator attention requirements for the laser printers will more than outweigh this small extra cost, making a laser printer the less expensive option in the end.—*Alfred Poor*

## OPERATING ENVIRONMENTS

### Closing All Windows in Windows 95

*Is there an easy way to close all the opened windows in Windows 95 without having to do it one window at a time? Every day, ten times a day, it seems I end up with 26 windows open and have to close them all, one by one.*

JOHN GENOVESI  
Greenville, Pennsylvania

**PC MAGAZINE:** If the clutter of open windows includes a series of Explorer windows drilling deeper and deeper into your directory structure, you can get rid of the whole series at once by (1) holding down the Shift key while closing the deepest window. This will automatically close all other Explorer windows that you opened in the process of navigating down to that level.

You can (2) minimize all windows by right-clicking the Taskbar and selecting Minimize All Windows from the context menu. Once you've done this, the Taskbar's context menu will acquire a new menu choice titled Undo Minimize All.

If you have network options or multiple user profiles enabled, you can (3) close all running programs by choosing Shut Down from the Start menu and selecting the last option, "Close all programs and log on as a different user." Just log on as yourself again. You can use this solution and the others in Windows NT 4.0 as well.

Under Windows 95, you can also (4) choose "Restart the computer," then hold down the Shift key while clicking Yes. Don't release the Shift key until you see "Windows is now restarting" on the screen. Depending on how many windows you have open, this may be faster than closing them all individually.—*Neil J. Rubenking*

### Surprise File Deletion

*Under Windows 95, Explorer will allow me to delete read-only files without alerting me to their status. If I use File Manager I receive a*

*warning. Do you know if there is any way to make Explorer do the same?*

JEFF STEIFEL  
via the Internet

**PC MAGAZINE:** Normally when you attempt to delete a read-only file in Explorer, whether under Windows 95 or Windows NT 4.0, you're confronted with a message like "The file 'Foobar.txt' is a read-only file. Are you sure you want to move it to the Recycle Bin?" This confirmation has been turned off on your system, so when you delete a file—even a read-only file—it gets sent directly to the Recycle Bin.

You won't find a setting in Explorer to suppress or restore this confirmation. It's actually controlled by the Recycle Bin's properties, not Explorer's. Right-click the Recycle Bin, choose Properties, and on the Global page check the box corresponding to "Display delete confirmation dialog." Then click OK. That should restore your confirmation dialog.

It is possible to bypass the Recycle Bin if you're sure you want to delete a file. Simply press Shift-Delete, or hold down Shift while selecting Delete from the context menu. Deleting a file in this way will always trigger a confirmation dialog, regardless of Recycle Bin's property settings.—*Neil J. Rubenking*

### Windows 95 Start-Up Logo Hides Config.sys Errors

*When I first upgraded to Windows 95, I had no problems, but now every time I boot I get a message that there is an error in the Config.sys file. Is there any way to tell what the Config.sys problem is, so I can correct it? I've done a good deal of customizing of my desktop and start-up, so I'd prefer not to reinstall Windows 95.*

GREGOR DAVIS  
via the Internet

**PC MAGAZINE:** To identify which line in Config.sys is causing trouble, you need to see how the file is processed. Open a DOS box, switch to the root directory of your boot drive, and then unprotect the file Msdos.sys by using the command

```
ATTRIB -R -S -H MDS.SYS
```

Now edit Msdos.sys. You'll find that it looks like an .INI file. In the [Options] section, if the line LOGO=1 is present, change it to LOGO=0. If not, insert the line LOGO=0. Save your changes, and restore the protection to Msdos.sys by using the Attrb command again, but this time change the three minus

signs to plus signs. Now restart the computer.

Because of the change you made in Msdos.sys, the Microsoft start-up screen will not cover up the processing of Config.sys, and you may see a message about an unrecognized command or other error on a particular line. In that case, once Windows 95 has finished loading, open Config.sys and look at the command on the specified line. You may see an error message when Windows 95 tries to load a particular device. Fixing the problem may be a matter of deleting the offending line, or it may involve correcting the line. If the line refers to a driver or other file, check to make sure the file is present in the specified directory. The details of your repair job will depend on what error message is displayed.

Once you've finished your corrections, you may want to reverse the steps above in order to restore the Microsoft logo. That is, unprotect Msdos.sys, change the Logo=0 line to Logo=1, and then restore the file's protection. Or you may prefer to leave things as they are, with the start-up logo disabled.—*Neil J. Rubenking*

### Open Many Files from One Shortcut

*Is there a way to assign multiple targets to one shortcut in Windows 95? I frequently need to open the same two files many times. It would be ideal to do this from a single shortcut.*

YISROEL PINSON  
via the Internet

**PC MAGAZINE:** Whether you're using Windows 95 or Windows NT 4.0, a single shortcut can't have multiple target files. But you can get the desired effect with a shortcut to a batch file that launches multiple files. Assuming the data files are each associated with a particular application, your batch file can launch each one using the START command—for example,

```
START C:\MYPROJ\MYPROJ.DOC  
START C:\MYPROJ\MYPROJ.BMP
```

If one of the files isn't associated with an application, or if you want to open a file with an application other than the associated one, in most cases you can spell out the application name and put the filename on its command line. For example:

```
"C:\Program Files\Accessories\WORDPAD.EXE" C:\MYPROJ\MYPROJ.DOC
```

Note the quotation marks around the executable's pathname, required because of the space in "Program Files."



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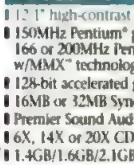


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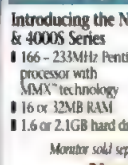


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|--------|--------|--------------------|------|--------|-------|------------|----------|--------|
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| #97050 | 440CDS | 133MHz w/MMX*      | 16MB | 1.44GB | 10XCD | 12.1" HCD  | 6.9      | '2,399 |
| #97051 | 440COT | 133MHz w/MMX*      | 16MB | 1.44GB | 10XCD | 12.1" TFT  | 6.9      | '2,799 |
| #97052 | 460COT | 166MHz w/MMX*      | 32MB | 2.0GB  | 10XCD | 12.1" TFT  | 6.9      | '3,099 |

\*Intel Pentium® processor with MMX™ technology versions.

### Infinia Desktop Series

|        |      |        |      |             |     |       |        |
|--------|------|--------|------|-------------|-----|-------|--------|
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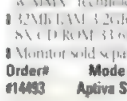
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| Order# | Model | Pentium® processor | RAM/HD/CD     | Display    | Wt (lb.) | Price  |
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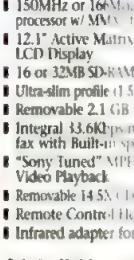
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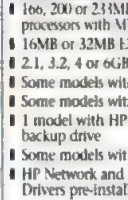
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| #99485 | 8174  | 200MHz MMX         | 32MB | 2.1GB | 24X | 56Kbps | '1,599 '64 |
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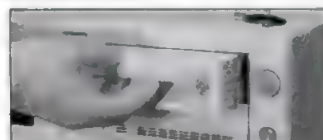
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### IDE HARD DRIVES

| IDE    | RPM  | Brand           | Model    | Price |
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| 1281MB | 5200 | Western Digital | AC11200  | \$152 |
| 1624MB | 5200 | Western Digital | AC21600  | \$160 |
| 1700MB | 4500 | Seagate         | ST31720A | \$155 |
| 1750MB | 4480 | Maxtor          | M81750A  | \$155 |
| 1750MB | 5400 | Fujitsu         | MPA3017A | \$157 |
| 2000MB | 4500 | JTS             | JTS2000  | \$168 |
| 2000MB | 5200 | Western Digital | AC22000  | \$177 |
| 2100MB | 4480 | Maxtor          | M82100A  | \$181 |
| 2132MB | 4500 | Seagate         | ST32132A | \$170 |
| 2500MB | 5200 | Micropolis      | MC4325A  | \$181 |
| 2557MB | 4500 | Seagate         | ST32531A | \$174 |
| 2559MB | 5200 | Western Digital | AC22500  | \$197 |
| 2560MB | 5400 | Maxtor          | M82560A  | \$182 |
| 2620MB | 5400 | Fujitsu         | MPA3026A | \$175 |
| 3000MB | 4500 | JTS             | JTS3000  | \$194 |
| 3166MB | 5200 | Western Digital | AC33100  | \$209 |
| 3201MB | 4480 | Maxtor          | M83201A  | \$216 |
| 3245MB | 4500 | Seagate         | ST33240A | \$196 |
| 3500MB | 5400 | Fujitsu         | MPA3035A | \$194 |
| 4000MB | 5200 | Western Digital | AC34000  | \$205 |
| 4000MB | 5200 | Micropolis      | MC4340A  | \$240 |
| 4320MB | 4500 | Seagate         | ST34320A | \$259 |
| 4320MB | 4480 | Maxtor          | M84320A  | \$264 |
| 4320MB | 3600 | Quantum         | BF4335A  | \$211 |
| 4326MB | 4500 | Seagate         | ST34340A | \$259 |
| 4370MB | 5400 | Fujitsu         | MPA3043A | \$265 |
| 5000MB | 5200 | Micropolis      | MC4350A  | \$299 |
| 5120MB | 5400 | Maxtor          | M85120A  | \$318 |
| 5250MB | 5400 | Fujitsu         | MPA3052A | \$325 |
| 6450MB | 5400 | Seagate         | ST36450A | \$359 |
| 6510MB | 3600 | Quantum         | BF6510A  | \$314 |
| 7000MB | 5200 | Maxtor          | M87000A  | \$431 |

### SCSI HARD DRIVES

Add a DPT 2044UB Ultra SCSI controller \$199

| SCSI    | RPM    | Brand      | Model     | Price  |
|---------|--------|------------|-----------|--------|
| 2150MB  | 5400   | Seagate    | ST32150N  | \$229  |
| 2151MB  | 5400   | Quantum    | FB32150N  | \$235  |
| 2160MB  | 7200   | Seagate    | ST32170N  | \$429  |
| 2275MB  | 7200   | Quantum    | VK32275S  | \$359  |
| 3220MB  | 5400   | Quantum    | FB32240S  | \$299  |
| 3300MB  | 5400   | Micropolis | MC4743    | \$335  |
| 4310MB  | 5400   | Quantum    | FB34320S  | \$329  |
| 4400MB  | 7200   | Fujitsu    | M2954S    | \$559  |
| 4500MB  | 7200   | Micropolis | MC4345    | \$529  |
| 4550MB  | 7200   | Micropolis | MC4345AV  | \$529  |
| 4550MB  | 7200   | Seagate    | ST34572N  | \$619  |
| 4550MB  | 7200   | Quantum    | XP34550S  | \$565  |
| 4550MB  | 10,000 | Quantum    | XP34501N  | \$709  |
| 6440MB  | 5400   | Quantum    | FB36480S  | \$4552 |
| 9100MB  | 7200   | Micropolis | MC3391    | \$889  |
| 9100MB  | 7200   | Fujitsu    | M2949S    | \$959  |
| 9100MB  | 7200   | Quantum    | XP39100S  | \$969  |
| 9100MB  | 7200   | Micropolis | MC3391AV  | \$999  |
| 9100MB  | 7200   | Seagate    | ST39171W  | \$989  |
| 9100MB  | 10,000 | Seagate    | ST39101N  | \$1139 |
| 23300MB | 5400   | Seagate    | ST423451N | \$2049 |

### WIDE HARD DRIVES

Add a DPT 2044UB Ultra Wide SCSI controller for \$249

| WIDE    | RPM    | Brand      | Model     | Price  |
|---------|--------|------------|-----------|--------|
| 2160MB  | 7200   | Seagate    | ST32272W  | \$459  |
| 2275MB  | 7200   | Quantum    | VK32275W  | \$359  |
| 4300MB  | 5400   | Micropolis | MC4743W   | \$355  |
| 4400MB  | 7200   | Fujitsu    | M2954W    | \$569  |
| 4550MB  | 7200   | Micropolis | MC4345W   | \$555  |
| 4550MB  | 7200   | Micropolis | MC4345WAV | \$619  |
| 4550MB  | 7200   | Seagate    | ST34572W  | \$659  |
| 4550MB  | 7200   | Quantum    | VK34550W  | \$565  |
| 4550MB  | 7200   | Quantum    | XP34550W  | \$669  |
| 4550MB  | 10,000 | Seagate    | ST34501W  | \$749  |
| 9091MB  | 5400   | Micropolis | MC3391W   | \$949  |
| 9091MB  | 7200   | Fujitsu    | M2949W    | \$989  |
| 9100MB  | 7200   | Quantum    | XP39100W  | \$969  |
| 9100MB  | 7200   | Seagate    | ST39171W  | \$1029 |
| 9100MB  | 10,000 | Seagate    | ST39101W  | \$1179 |
| 23300MB | 5400   | Seagate    | ST423451W | \$2099 |

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### CD ROM DRIVES

| IDE CD ROM |            | New! Teac 32X |     | \$115 |
|------------|------------|---------------|-----|-------|
| Speed      | Brand      | Model         | ms  | Int   |
| 12X        | CyberDrive | CYBER12X      | 150 | \$69  |
| 16X        | Mitsumi    | CRMX16X       | 120 | \$92  |
| 16X        | NEC        | CDR1600       | 100 | \$85  |
| 16X        | Toshiba    | XM6002B       | 90  | \$87  |
| 24X        | Panasonic  | CR585         | 85  | \$99  |
| 24X        | Mitsumi    | CRMX24X       | 90  | \$102 |
| 24X        | Toshiba    | XM6102B       | 85  | \$103 |

| IDE CD CHANGERS |           |          |         |       |
|-----------------|-----------|----------|---------|-------|
| Speed           | Brand     | Model    | # Disks | Int   |
| 6X              | NEC       | CDR4X6   | 4       | \$79  |
| 8X              | NEC       | CDR4X8   | 4       | \$105 |
| 12X             | Panasonic | SOTCS12H | 5       | \$266 |

### IDE CD CHANGERS

| Speed | Brand     | Model    | # Disks | Int   |
|-------|-----------|----------|---------|-------|
| 6X    | NEC       | CDR4X6   | 4       | \$79  |
| 8X    | NEC       | CDR4X8   | 4       | \$105 |
| 12X   | Panasonic | SQTC512N | 5       | \$266 |

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### SCSI CD ROM

| Speed | Brand   | Model         | ms  | Int   |
|-------|---------|---------------|-----|-------|
| 12X   | Plextor | PX12TS(tray)  | 105 | \$197 |
| 12X   | Plextor | PX12CS(caddy) | 105 | \$259 |
| 15X   | Toshiba | XM3801B       | 99  | \$145 |
| 16X   | NEC     | CDR1610       | 100 | \$135 |
| 20X   | Plextor | PX20TS        | 95  | \$225 |
| 24X   | NEC     | CDR1810       | 85  | \$159 |

### SCSI CD CHANGERS

| Speed | Brand     | Model | # Disks | Price |
|-------|-----------|-------|---------|-------|
| 16X   | Nakamichi | MJ516 | 5       | \$239 |

### SCSI CD TOWERS

| Speed | Brand   | Model | Price  |
|-------|---------|-------|--------|
| 15X   | Toshiba | 99ms  | \$819  |
| 16X   | NEC     | 100ms | \$859  |
| 20X   | Plextor | 95ms  | \$1259 |

### SCSI CD TOWERS w/ 5 Disc Changers

| Brand     | Model     | Price  |
|-----------|-----------|--------|
| Nakamichi | 16X 150ms | \$1399 |
|           |           | \$2219 |

Ethernet adapter option available. Call.

### CD RECORDERS

| Brand                                            | Model                                                                                                                   | Price  |
|--------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------|--------|
| Sony 2x6                                         | Internal SCSI drive (CDU9265)                                                                                           | \$309* |
| Yamaha 4x8                                       | Internal SCSI drive (YCDR400T)                                                                                          | \$469* |
|                                                  | Internal SCSI drive caddy load (YCDR400)                                                                                | \$479* |
| Ricoh 2x6 CD Rewritable                          | Internal SCSI drive 1MB, tray load (RO6200S)                                                                            | \$419* |
|                                                  | Internal SCSI drive 2MB, caddy load (RO6201S)                                                                           | \$469* |
| Hewlett Packard SureStore 6020i                  | Call about new HP SureStore CD Rewritable SureStore 6020i includes software, and 1 disk                                 |        |
| Internal SCSI (C4343CDR)                         |                                                                                                                         | \$369  |
| Complete internal kit w/ controller (C4343CDR-1) |                                                                                                                         | \$409  |
| Internal for parallel printer port (C4345A)      |                                                                                                                         | \$545  |
| Sony 2x8                                         | Internal IDE (CDU9285)                                                                                                  | \$349* |
|                                                  | Kit w/ 1 disk, and software compatible with Win 95 & Win NT 3.51 & up. Req IDE controller. (CDU9285KIT)                 | \$369  |
| Mitsumi 2x6                                      | IDE kit includes 3 disks, and software compatible with Win 95 & Win NT 3.51 & up. Requires IDE controller. (CRMC2600TE) | \$415  |

\*Drive must be purchased with CDR software or media.

### ULTRA IDE HARD DRIVES

| Brand                                                 | Model                     | Price |
|-------------------------------------------------------|---------------------------|-------|
| FUJITSU                                               | 1750MB 10ms 5400 MP3017U  | \$162 |
|                                                       | 2620MB 10ms 5400 MP3026U  | \$180 |
|                                                       | 3500MB 10ms 5400 MP3035U  | \$201 |
|                                                       | 4370MB 10ms 5400 MP3043U  | \$265 |
|                                                       | 5250MB 10ms 5400 MP3052U  | \$325 |
| QUANTUM                                               | 1614MB 10ms 5400 FB31620A | \$150 |
|                                                       | 2151MB 10ms 5400 FB31100A | \$181 |
|                                                       | 3228MB 10ms 5400 FB3240A  | \$212 |
|                                                       | 4310MB 10ms 5400 FB34320A | \$249 |
|                                                       | 6448MB 10ms 5400 FB36480A | \$346 |
| MAXTOR                                                | 7000MB 10ms 5200 MB7000X  | \$389 |
| SEAGATE                                               | 2111MB 12ms 4500 ST32122A | \$177 |
|                                                       | 3227MB 12ms 4500 ST32322A | \$199 |
|                                                       | 4303MB 12ms 4500 ST34342A | \$255 |
| WESTERN DIGITAL                                       | 4304MB 11ms 5400 AC34300  | \$288 |
|                                                       | 5160MB 12ms 5400 AC35100  | \$345 |
| Premise PCI Ultra IDE Controller (ULTRA33) with drive |                           | \$30  |

We Can: Install any of these drives in external enclosures, and custom configure to your specifications.

### TAPE DRIVES

| EXABYTE                                                        | Model                     | Price  |
|----------------------------------------------------------------|---------------------------|--------|
| 3.5-7Gig                                                       | 8mm, 32MB/min, EXB8205XL  | \$1189 |
| 7-14Gig                                                        | 8mm, 120MB/min, ELIANT820 | \$1499 |
| 7-14Gig                                                        | 8mm, 60MB/min, EXB8700LT  | \$679  |
| 7-14Gig                                                        | 8mm, 60MB/min, EXB8700    | \$939  |
| (E88700 includes 1 tape, 1 cleaning tape, and backup software) |                           |        |
| 20-40Gig                                                       | 8mm, 360MB/min, EXB8900   | \$3679 |
| 70-140Gig                                                      | 8mm, 60MB/min, EXB10H     | \$4239 |

### HEWLETT PACKARD

| Model                                  | Price  |
|----------------------------------------|--------|
| 2-Gig DAT, 11MB/min, C1534AI           | \$579  |
| 2-4Gig DAT-DC, 42MB/min, C1536AI       | \$609  |
| 4-8Gig D05-2 DAT, 60MB/min, C1599AI    | \$819  |
| 12-24Gig D05-3 DAT, 120MB/min, C1554AI | \$1199 |
| 72-144G D05-3 DAT, 120MB/min, C5648A   | \$2699 |

### SEAGATE

| Model                                    | Price  |
|------------------------------------------|--------|
| 2-4Gig DAT-DC, 66MB/min, STD24000N       | \$589  |
| 4Gig Mini, 29MB/min, T57800N             | \$339  |
| 4-8Gig D05-2 DAT, 66MB/min, STD28000N    | \$795  |
| 12-24Gig D05-3 DAT, 132MB/min, STD24000N | \$1059 |

### SEAGATE MINI CART

Prices include Dos/Win backup software & 1 tape  
800MB TR1, T57800R \$89 Parallel ver \$129  
3.2Gig TR3, T573200 I79 Parallel ver \$185  
4-8Gig TR4, T578000 IDE or SCSI \$339

### SONY \$20 rebate w/ hard drive purchase

| Model                                    | Price  |
|------------------------------------------|--------|
| 4-8Gig D05-2 DAT, 44MB/min, SDT5000AI    | \$695  |
| 4-8Gig D05-2 DAT, 90MB/min, SDT7000AI    | \$759  |
| 12-24Gig D05-3 DAT, 144MB/min, SDT9000AI | \$1039 |
| 32-64Gig D05-2 DAT, 90MB/min, TSL7000X   | \$2099 |

### QUANTUM

| Model                                      | Price  |
|--------------------------------------------|--------|
| 15-30Gig DLT, 150MB/min, DLT2000XT         | \$2499 |
| 20-40Gig DLT, 180MB/min, DLT4000           | \$3239 |
| 75-150Gig DLT loader, 150MB/min, DLT2500XT | \$4779 |
| 100-200Gig DLT loader, 180MB/min, DLT4500  | \$6219 |
| 105-210Gig DLT loader, 150MB/min, DLT700XT | \$6539 |
| 140-280Gig DLT loader, 180MB/min, DLT4700  | \$8109 |

### REMOVABLE DRIVES

| Model                                    | Price     |
|------------------------------------------|-----------|
| IONEGA 100MB ZIP                         |           |
| Internal SCSI for PC (ZIP100A)           | \$145     |
| Internal IDE for PC (ZIP100A)            | \$115     |
| External SCSI for PC or Mac (ZIP100)     | \$145     |
| External for PC parallel port (PPZIP100) | \$145     |
| 100MB disks (ZIP100) Qty 2-9/Qty 10+     | \$18/\$14 |

### IONEGA 1Gig JAZZ

| Model                                           | Price          |
|-------------------------------------------------|----------------|
| Internal SCSI with 1 disk (JAZZ)                | \$285          |
| Internal SCSI in our case with 1 disk (JAZEX)   | \$348          |
| External SCSI in Iomega case with 1 disk (JAZX) | \$388          |
| Disks Qty 2-4/5-9/10+ 1Gig                      | \$87/\$85/\$82 |
| SYQUEST 230MB Flyer                             |                |
| Ext. SCSI (EZ300S)                              | \$146          |
| Ext Parallel (EZ300P)                           | \$146          |
| Extra Disks Qty 2-4/5-9/10+                     | \$28/\$26/\$24 |
| SYQUEST 1.5GB SyJet                             |                |
| Int. SCSI (SYJET1.5PCI)                         | \$288          |
| Ext. SCSI (SYJET1.5PCI)                         | \$383          |
| Extra Disks Qty 2-4/5-9/10+                     | \$86/\$84/\$82 |

### OPTICAL DRIVES

|                                                              |        |
|--------------------------------------------------------------|--------|
| <b>FUJITSU</b> Call about 5 Free Disks w/640MB Drives!       |        |
| <b>230MB</b> + 128MB compatible, 30ms, 3600rpm               |        |
| Internal IDE w/ 1 free disk (M25141C)                        | \$279  |
| <b>640MB</b> + 230MB t/w & 128MB read compatible, 2MB buffer |        |
| Internal SCSI w/ 1 free disk (M2513A2WC)                     | \$419  |
| <b>MAXOPTIX</b>                                              |        |
| <b>2.8Gig</b> + (1.3Gig, 650MB t/w compatible), 1MB buffer   |        |
| Internal SCSI (TAHIT2.6)                                     | \$1375 |
| <b>TORAY</b>                                                 |        |



# PCTech Ask Our Advisors

After creating the batch file, create a shortcut to it on your desktop or in the Start menu. Right-click on the shortcut, choose *Properties*, and select the *Program* page in the resulting dialog. Check the box labeled *Close on exit* and select *Minimized* from the combo box labeled *Run*. When you launch this shortcut, the batch file will open your selected data files. The batch file never appears on the screen except as a Taskbar button, and it vanishes after launching the files, giving the impression of a single shortcut that launches multiple files.—Neil Rubenking

## WORD PROCESSING

### Sharing Files Between Word 97 and Word 6 or 7

*Word 97 will let you save a file in a format that's listed in the Save As Type pull-down list as Word 6.0/95 (\*.doc) format. But I've heard that this actually saves in RTF (rich text format) and that it's not the best choice for sharing files between Word 97 and Word 6 or Word 7 users. Can you confirm this, suggest what the drawbacks are, and explain any alternatives that might be preferable?*

LARRY WARNET  
via PC Magazine Online

**PC MAGAZINE:** What you've heard is right on both counts: The Word 6.0/95 converter that originally shipped with Word 97 saves in RTF format despite the .DOC extension, and it's not the best choice for sharing files with Word 6.0 or Word 7.0 users. The preferred choice until recently was an import converter for Word 6 and 7 that let earlier versions of the program read Word 97 format files directly. A second, newly available choice is an export converter for Word 97 that saves files in true Word 6 format. (Word 6 and Word 7 use the same format. For convenience, I'll refer to it as the Word 6 format for the rest of this discussion.)

Saving in RTF using the Word 6.0/95 file type option creates several potential problems. The most significant is that file size can grow enormously compared with what happens when you save in Word 97 or Word 6 format, particularly if the file includes graphics, heavy formatting, or inserted objects. This is inherent in the RTF format, since it represents all binary information, including pictures, as text.

By way of demonstration, I created a short document with a few lines of text, a table, and an inserted Excel worksheet. The Word 97 version of this document was 24K. The RTF version was about three times as large, at 74K. In real documents, it's not unusual to wind up with an RTF file ten times the size of

the same document in Word 97 format.

Microsoft's original solution to this problem was a set of import converters for Word 6 and Word 7. If you have Word 6 or Word 7 and there's any possibility of getting a file from someone else in Word 97 format, these import converters are well worth installing. You can find Wrd97cnv.exe on the Word 97 or Office 97 CD-ROM in the Valupack\Wrd97cnv directory. If you don't have a colleague or friend who has the Word or Office 97 CD-ROM, you can find the file on Microsoft's Web site.

At this writing, the appropriate URL for the converters is [www.microsoft.com/word/freestuff/converters/wrd97cnv.htm](http://www.microsoft.com/word/freestuff/converters/wrd97cnv.htm). The Web page will give you more details about the converters, along with installation instructions and an option to download the file. Running Wrd97cnv.exe installs the import converter automatically.

As of this past June, the import converters for Word 6 and Word 7 have been joined by an export converter for Word 97. Unlike the original Word 6.0/95 converter, this new version saves files in true Word 6 format from within Word 97, using the *File | Save As* command. In other words, the converter lets Word 97 do what you'd expect it to do from the beginning.

You can also find the export converter on Microsoft's Web site. At this writing, the appropriate URL for Wrd6ex32.exe is [www.microsoft.com/Officefreestuff/word/dlpages/wrd6ex32.htm](http://www.microsoft.com/Officefreestuff/word/dlpages/wrd6ex32.htm). Here again, the Web page offers more details about the export converter, along with a choice for downloading the file. Note that some versions of Word 97 (Japanese, Korean, Simplified Chinese, and Traditional Chinese) require a different converter that is not available at the time of this writing. Note, too, that some versions (Arabic, Hebrew, Thai, and Vietnamese) already ship with the updated converter.

Once you have downloaded the .EXE file, you simply run it to install the converter. It replaces the original RTF converter, so that once it is installed, the *Save As* Word 6.0/95 file type option will save in true Word 6 format.

The export converter is also the key component of the Office 97 service release SR-1, which should be available by the

time you read this. (The service release also includes some enhancements for Outlook and Access, plus support for MMX to improve performance for OfficeArt, the shared drawing tool in Office 97). If you're not sure you have the service release already installed, choose *Help | About* in Word. If it's installed, the program name will show as Microsoft Word 97 SR-1.

Finally, be aware that because of differences in features between Word 97 and earlier versions, you may lose some data, formatting, macros, and the like when you move a document from Word 97 to Word 6 format, no matter which route you take for the conversion. You can find details about features that are partially supported or not supported at all on the Web pages I've already mentioned.

—M. David Stone

## SPREADSHEETS

### Converting Degrees and Decimals

*I often need to convert latitude and longitude from degrees-minutes-seconds to decimal degrees, or vice versa. My HP 19B-II calculator can do this. For example, I can enter my own latitude of 40.698° N and just press a button to convert that to 40° 41' 52.8". I can also do it in Microsoft Encarta World Atlas. But I can't seem to find a built-in Excel function that will do it. Do you have any ideas?*

ERIC MILLER  
via the Internet

**PC MAGAZINE:** The Visual Basic for Applications code in Figure 1 creates a user-defined Excel function that converts degrees, expressed as a decimal fraction, to a text string with degree, minute, and second components.

```
Function DegMinSec(Degrees) As String
    Dim Deg, Min As Integer, Sec As Double, Neg As Boolean
    If Degrees < 0 Then
        Degrees = -Degrees
        Neg = True
    End If
    Deg = Int(Degrees)
    Sec = (Degrees - Deg) * 3600
    Min = Int(Sec / 60)
    Sec = Sec - (Min * 60)
    Sec = Application.Round(Sec, 3)
    DegMinSec = Str(Deg) & Chr(186) & Str(Min) & "' & _
    Str(Sec) & Chr(34)
    If Neg = True Then DegMinSec = "-" & Right(DegMinSec,
    Len(DegMinSec) - 1)
End Function
```

**FIGURE 1:** This Visual Basic for Applications code creates an Excel custom function that converts decimal degrees to text in the format deg° min' sec".



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```
Function DegDecimal(DegMinSec) As Single
    Dim Sign, DegPos, PrimePos, DblPrimePos As Integer
    Dim Deg, Min, Sec As Integer
    If Left(DegMinSec, 1) = "-" Then
        Sign = -1
    Else
        Sign = 1
    End If
    DegPos = InStr(DegMinSec, Chr(186))
    Deg = Val(Left(DegMinSec, DegPos - 1))
    PrimePos = InStr(DegMinSec, "'")
    Min = Val(Mid(DegMinSec, DegPos + 2, PrimePos - DegPos - 2)) * Sign
    DblPrimePos = InStr(DegMinSec, Chr(34))
    Sec = Val(Mid(DegMinSec, PrimePos + 2, DblPrimePos - PrimePos - 2)) * Sign
    DegDecimal = Deg + Min / 60 + Sec / 3600
End Function
```

**FIGURE 2:** This code creates an Excel function that converts a text string in the form *deg° min' sec"* to a decimal number.

The user-defined function in Figure 2 goes the other way, converting a text string in the form *deg° min' sec"* to a decimal number.

To use these functions, insert a new macro module into your Excel workbook and type the code. Then, on the worksheet, simply call the functions as you would call any built-in function. For example, if cell A1 contains the number 40.698, you could type =DegMinSec(A1) to get the text value 40° 41' 52.8". Or, if cell A1 has the text value 40° 41' 52.8", you could type =DegDecimal(A1) to get 40.698 (plus some additional points of precision).

DegMinSec works with negative numbers as well as positive. The *sec* component is rounded to three decimal places. If it were not, then 0 values here might occasionally appear as something like 0.0000000015, because of rounding errors that are inherent in spreadsheet design. If you want fewer or more points of precision for *sec*, modify the line that begins Application.Round, changing the 3 to whatever value you want.

DegDecimal assumes that its input text includes the degree, prime, and double prime symbols and that a single space separates *deg* from *min* and *min* from *sec*.

Users of Lotus 1-2-3 97 can create these functions in LotusScript. The LotusScript code is identical to the VBA code shown above, except that the line

```
Sec = Application.Round(Sec, 3)
```

should be changed to

```
Sec = Round(Sec, 3)
```

Users of earlier versions of 1-2-3 cannot use the 1-2-3 macro language to create custom @ functions but instead can apply the following

worksheet formulas:

```
=@STRING(@INT(A1),0)&@CHAR(248)
&" "&@STRING(@ABS(@INT((A1-@INT(A1))
*3600/60)),0)&" "&@STRING(@ABS(@MOD
((A1-@INT(A1))*3600,60)),3)
&@CHAR(34)
```

```
=@VALUE(@LEFT(A1,@FIND(@CHAR(248),
A1,0))+@IF(@LEFT(A1,1)="-",
-1,1)*@VALUE(@MID(A1,
@FIND(@CHAR(248),A1,0)+2,
@FIND("'",A1,0)-@FIND(@CHAR(248),
A1,0)-2))/60+@IF(@LEFT
(A1,1)="-",-1,1)*@VALUE(@MID(C8,
@FIND("'",A1,0)+2,@FIND(@CHAR(34),
A1,0)-@FIND("'",A1,0)-2))/3600
```

The first formula converts a DD.MMSS number to text. The second converts an appropriately formulated text string back to a DD.xxx number.—Craig Stinson

## DATABASES

### Removing Spaces from Strings

I have a table containing filenames with embedded spaces. For example, the filename *Cust.dbf* is stored in the table as

```
"CUST .DBF"
```

with four spaces embedded before the period.

Apparently the original application padded any filename with spaces before adding the period and file extension. This table has hundreds of entries. Is there a quick and easy way to remove the spaces? I'm using Microsoft FoxPro for Windows.

PREMCHAND RHAMBAROSE  
Woodside, New York

**PC MAGAZINE:** Try the CHRTRAN function. For example, to remove embedded spaces from all of the filenames in your table, enter the following commands in the Command window, assuming your table is named MyTable and the filename column is named FileName:

```
USE MyTable
REPLACE ALL FileName WITH
CHRTRAN(FileName, " ", "")
```

The CHRTRAN function is a string translation function. You provide the string to search and replace in the first argument, a "match" string containing the characters to search for in the second argument, and a replacement string containing the characters to substitute in the third argument. The function searches the first argument, replacing each character found from the match string with the corresponding character in the replacement string.

The match string and replace string are positional: The first character in the match string is replaced with the first character in the replace string, the second with the second, the third with the third, and so on. If a match string character has no corresponding character in the replace string, as when the replace string has fewer characters, the character is deleted.

In the example, blank spaces are replaced with the empty string (""), which really means, "Take each space character and put nothing in its place," effectively removing the spaces. Using the REPLACE ALL command ensures that this translation occurs on every row in the table.—Sal Ricciardi

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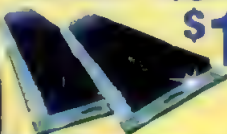
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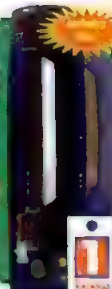


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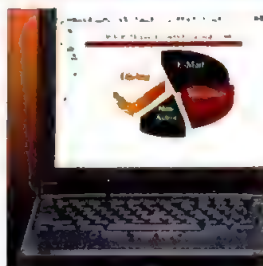
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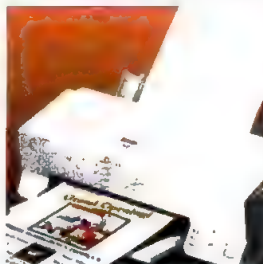
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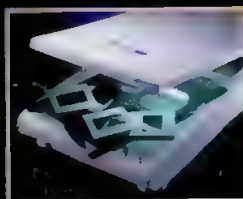
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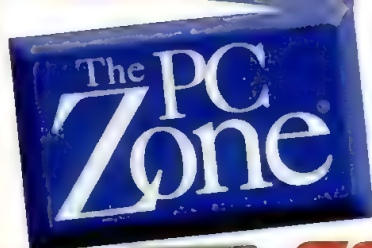
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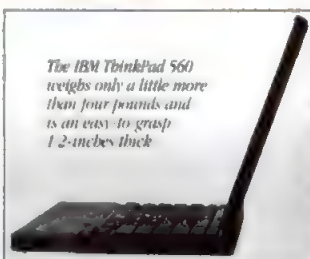
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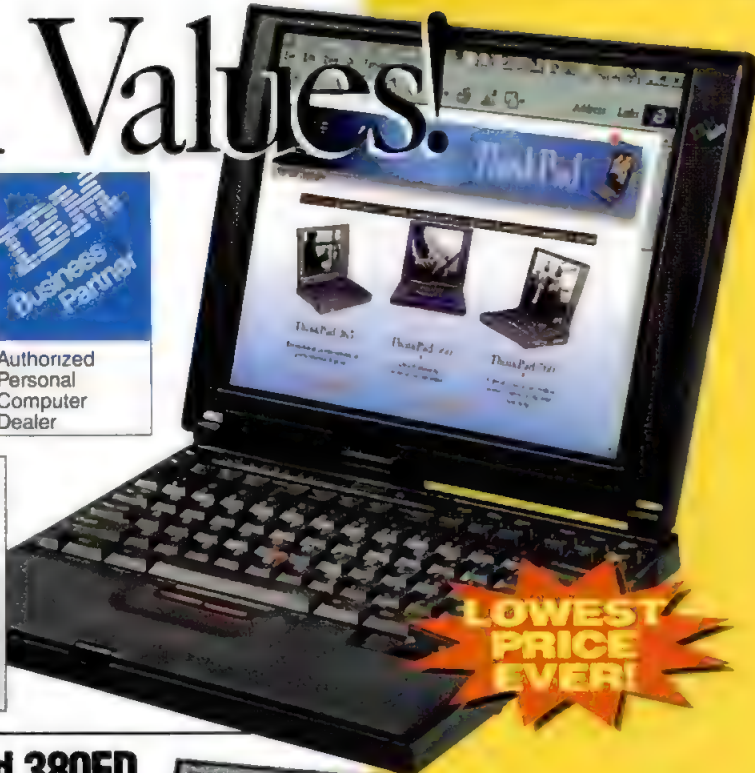
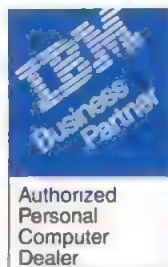
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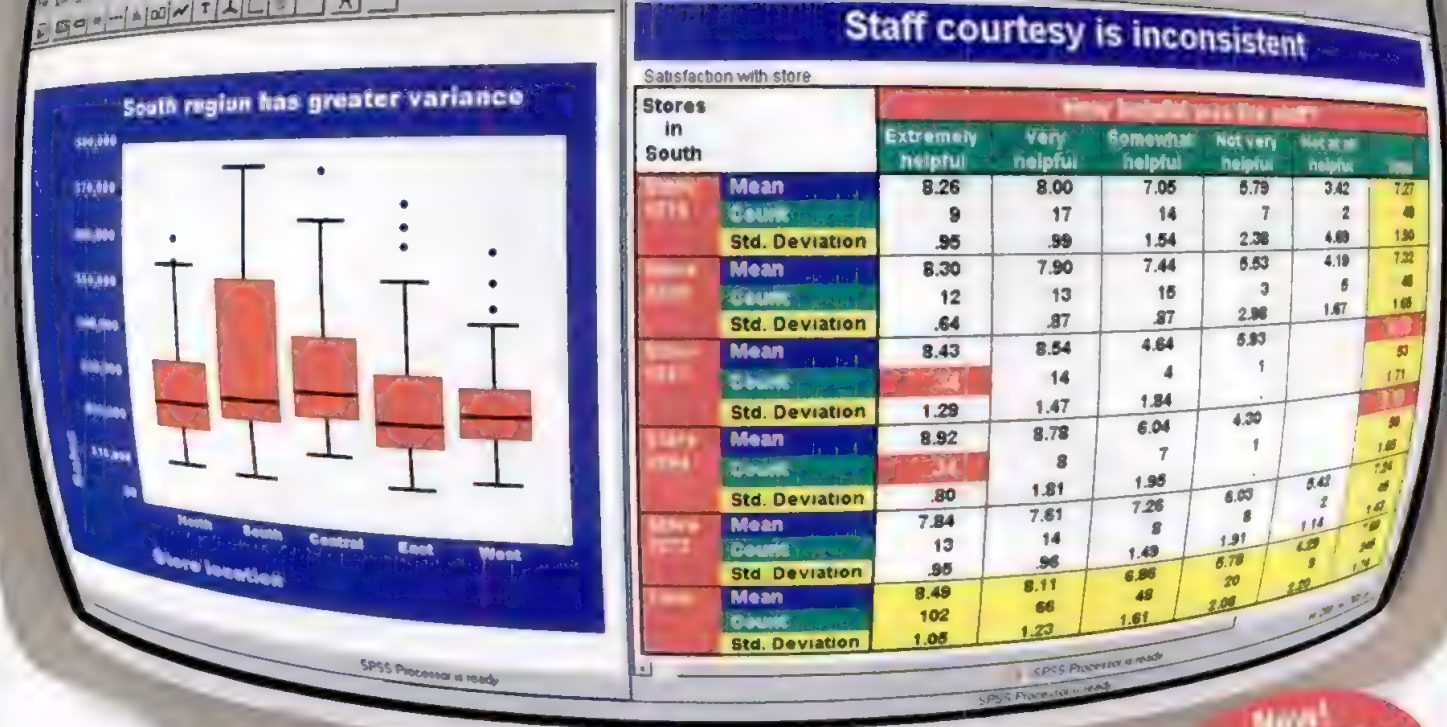


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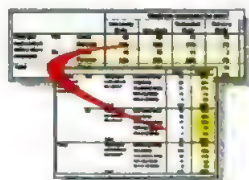
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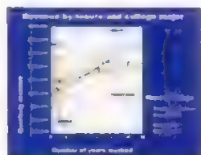
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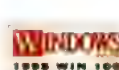
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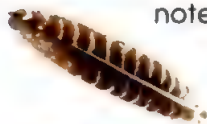
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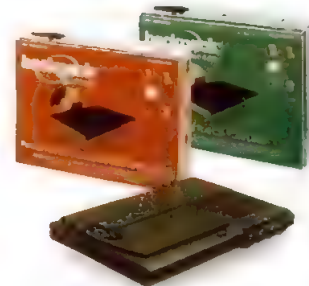
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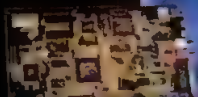
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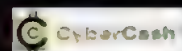
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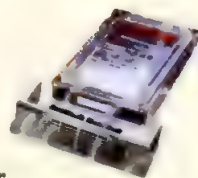
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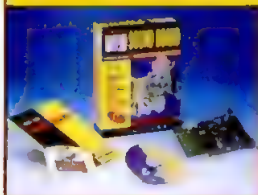
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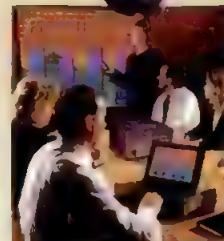
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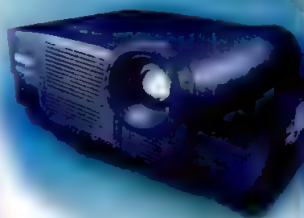
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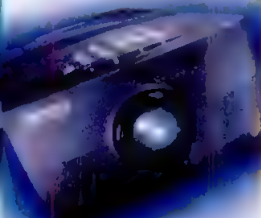
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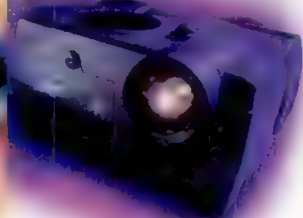
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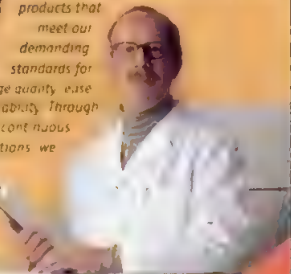
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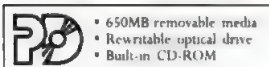
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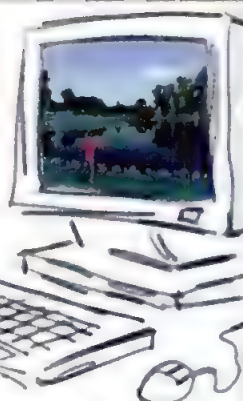
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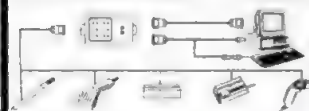
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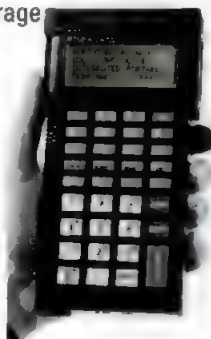
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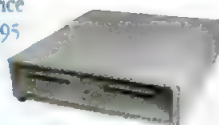
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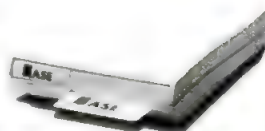
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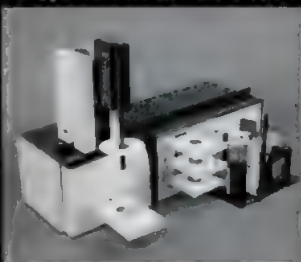
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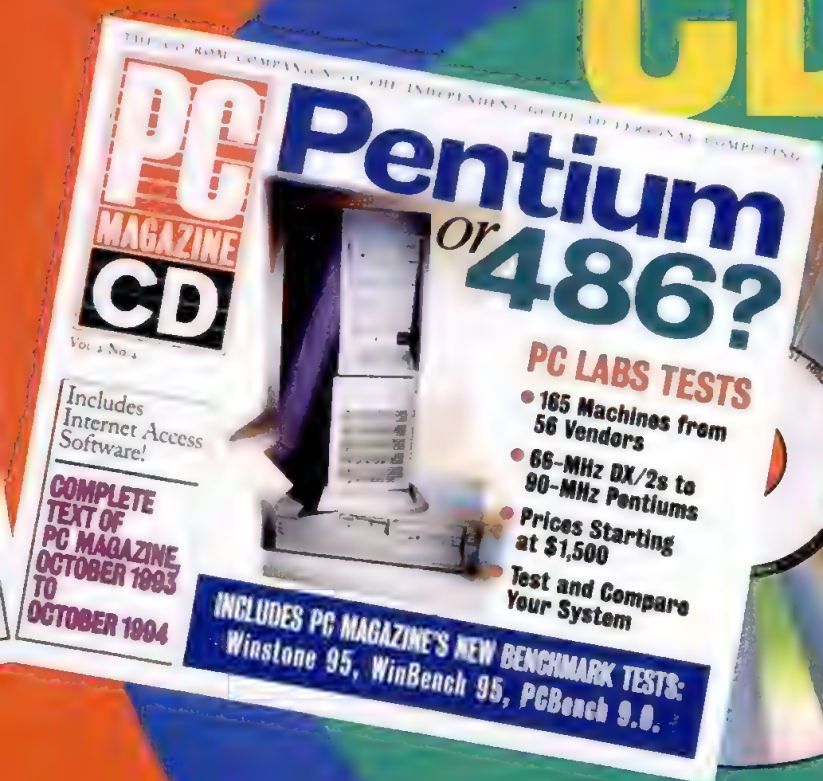
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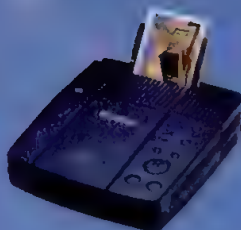
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# After Hours

## Start the Presses

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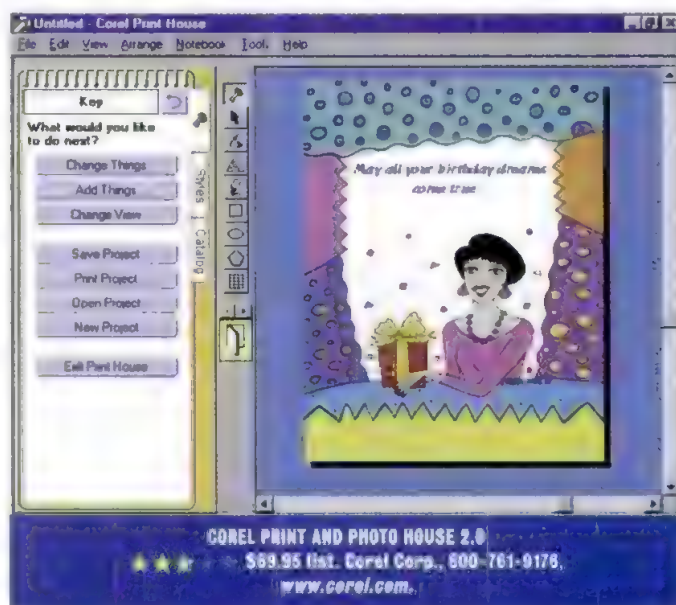
So much of the software we purchase and download lives only in the virtual world: We use it and see it on our monitors, but we get little if any tangible output. Personal desktop publishing software is one of the few categories that breaks this mold. This is the software that lets you design and print banners, calendars, greeting cards, and other fun projects to get some real value out of your PC and your color printer.

We looked at the five most popular products in this category: Corel Corp.'s Corel Print and Photo House (\$69.95 list), IMSI's MasterPublisher (\$30 street), Sierra On-Line's Print Artist, Version 4.0 (\$34.95 list), Mindscape's PrintMaster Gold Deluxe, Version 3.0 (\$50 street), and Broderbund Software's The Print Shop Publishing Suite (\$69.95 list). We examined each of these products for their ease of use, the number and types of projects that they offered, and the diversity of clip art and other graphics components included.

We also looked at each package's target audience: Was the title suitable for business users, or was it strictly for home users? One thing was clear throughout: All of the titles included here are sure to keep you and your kids occupied and your printer busy for an extended period of time.

Most of the programs are similar in terms of the types of

projects you can create, but two—PrintMaster Gold Deluxe, Version 3.0, and The PrintShop Publishing Suite—



include additional inventive projects and extra graphics and tools to help customize your output.—*All reviews by Karen J. Bannan*

### Corel Print and Photo House

Whether you're a beginning or expert user, you'll be able to take advantage of Corel Print and Photo House 2.0. As its name implies, this package comprises two programs: Print House is the desktop publishing software, and Photo House is an image-editing program.

Print House is tailored for a variety of users. You can get started in one of four ways: via

QuickWay (the program's wizard), working from a sample, starting from scratch, or opening an existing project. Each of the options gives you access to the program's inventive graphical user interface. Print House's many functions are accessible through a tab-driven interface that separates images from simple image- and text-

affords you a high level of control over your project and allows you to move back and forth quickly through the many steps of your project's development.

Photo House is your basic, average image-editing program, but it comes with a superior interface. You really don't need to know very much about the genre to get started. Everything in the program has a label or is icon-driven. There are a good selection of photo-retouching tools and an adequate supply of brushes and special effects. Although the number of images in Photo House is smaller than that of other packages in this story—only 7,000 images and 1,000 photographs—you can use the editing portion to create your own graphics. You can also use the included Netscape Navigator browser to surf the Web.

### MasterPublisher

Business users and professional graphic artists looking to create newsletters,

## INSIDE

### HIGH-SPEED HIT

Great game play makes XCar a racing fan's dream. *See page 446.*



### HEY, BATTY, BATTY!

Humongous recreates the thrill of the sandlot. *See page 446.*



# After Hours

brochures, and presentations should find a lot to like in IMSI's MasterPublisher.

Like Corel's package, MasterPublisher is actually two separate programs—TurboPublisher and TurboDraw. These two programs work in tandem but are fairly

The clip-art images are stored on a separate disk, so you don't have to fill your hard disk unnecessarily. These can be integrated with your projects, or you can use the TurboDraw program to customize them.

TurboDraw is an extremely capable vector-based program

frame or image, a smart-looking effect that some programs can't handle. The program also lets you apply stylesheets to entire documents. TurboDraw can handle multilayer images (which can really enhance the look of a project) four-color separations, and three-dimensional design. MasterPublisher also comes with a thesaurus and a spell-checker, so you can write presentations, spell-check them, and edit them from the same source.

## Print Artist

If you believe that "simple is as simple does," then you should find Sierra On-Line's Print Artist 4.0 to your liking.

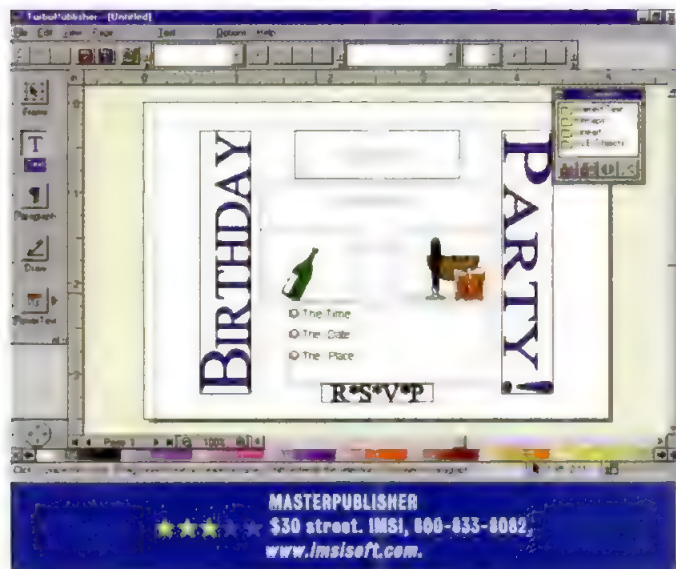
From the moment you begin the installation, you'll notice that everything in this program has been streamlined. Setup is largely automated, but you still get to choose whether or not you want to install all the fonts and images. If you're short on disk space, you can leave them on the CD-ROM and access them from there when you need them.

Once Print Artist is installed, you'll have no problem getting started. When you launch the program, you're given eight project choices: labels, signs, stationery, cards,

calendars, certificates, banners, and crafts. Each choice has numerous preformatted templates, but if you feel confident in your abilities, you can jump right in and start with a blank palette. In the early stages of a project, beginners will like the fact that all of Print Artist's main functions are controlled with a simple point-and-click interface. Unfortunately, when you get farther into your project, the interface becomes toolbar-driven, making it slightly harder to use.

Print Artist offers plenty of options and clip-art images. There are more than 10,000 graphics, 600 photos, and 300 fonts available to get you started. Once you drop objects and text into a layout, you can manipulate them by using the built-in, rudimentary image- and text-editing tools. Even though these image tools are clearly marked, they may be a little nonintuitive for some users. There is no toolbox or icon attached. And in addition, the drop-down menus can be clumsy for you to work with.

We liked the downloadable goodies that are added to the Sierra On-Line Web site ([www.sierra.com](http://www.sierra.com)) each month. There's also a Tips and Tricks



high-end in nature and are harder to learn than others in this roundup.

TurboPublisher is the desktop publishing component of the suite. It is designed to let you create documents using a word processor-style interface. Although the program can be used for businesses, home users can also use it to design cards, signs, stationery, and flyers. The program's dual-purpose toolbar can be customized for beginners, and several included wizards can help get you started. Still, this package does not include as many home-oriented options as the other products reviewed in this story. And the title comes with only 100 project templates, so casual or young users may need to look elsewhere.

On the bright side, the program ships with an incredible 20,000 clip-art images, 2,000 fonts, and 1,000 photographs.

for drawing and illustration that features floating toolbars and rulers, as well as a multitude of image-editing and drawing tools.

Both programs feature robust, advanced image-handling and editing capabilities. For example, TurboPublisher lets you have text flowing around a

## Personal Desktop Publishing

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|---------------------------------------|---------------------------------|-----------------|------------------|-----------------------------|--------------------------------|
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| Graphics or clip-art images included  | 7,000                           | 20,000          | 10,000           | 20,000                      | 24,800                         |
| Photos included                       | 1,000                           | 1,000           | 600              | 5,000                       | 1,200                          |
| Templates included                    | 1,600                           | 100             | 1,500            | 1,500                       | 125                            |
| <b>FEATURES AND TOOLS</b>             |                                 |                 |                  |                             |                                |
| Photo-scanning utility                | ✓                               | ✓               | ✓                | ✓                           | ✓                              |
| Image-editing software                | ✓                               | ✓               | ✓                | ✓                           | ✓                              |
| Database of quotes and phrases        | ✓                               | ✓               | ✓                | ✓                           | ✓                              |
| Spell-checker/Thesaurus               | ✓                               | ✓               | ✓                | ✓                           | ✓                              |
| Printed catalog of images             | ✓                               | ✓               | ✓                | ✓                           | ✓                              |
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# After Hours

section online, where you'll find helpful project hints to boost your user power. The program's help files are well laid out and very useful. If you get stuck, you can visit the Sierra home page and then tour the interactive tutorial, or access the free online technical support.

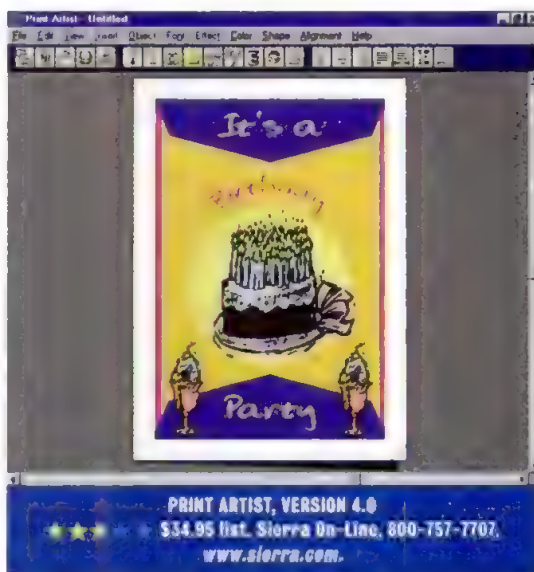
## PrintMaster Gold Deluxe



Original content, thousands of graphics and projects, and a superior

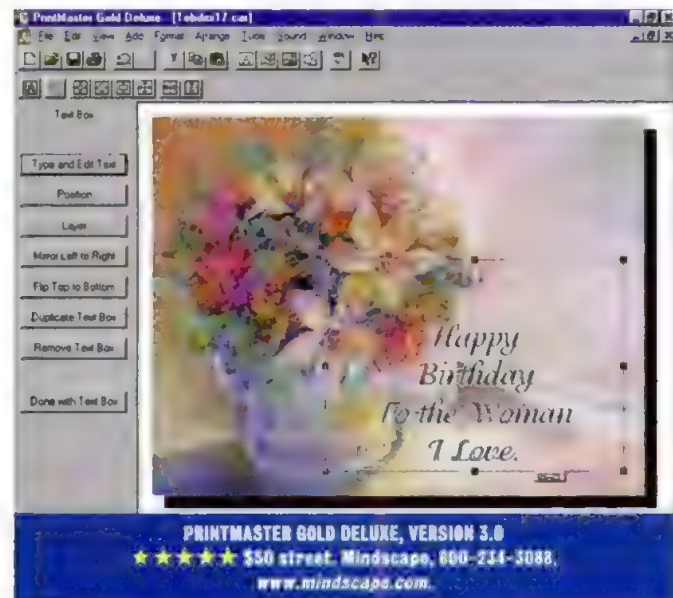
interface make PrintMaster Gold Deluxe 3.0 an easy pick as our Editors' Choice in this roundup.

PrintMaster offers a simple graphical user interface that resembles a grade-school notebook. All of the options are organized by tabs while you're setting up a project, but these tabs disappear when you're ready to dive into the actual manipulation and customization of your projects. Using PrintMaster, you can create newsletters, greeting cards, brochures, calendars,



business cards, signs, fax sheets, and a variety of other projects.

If you're just starting out, you'll love the more than 1,500 preformatted designs, which you can customize and personalize with only a few mouse clicks. To jump right in and create your own designs from scratch, you can use a simple wizard that sets the project parameters. If you get stuck during the creation process, you can turn to either written or on-screen and spoken help files, which are especially useful.



PrintMaster really shines in the graphics and photo image department. The program comes with more than 21,000 graphics and 5,000 photographs. Instead of the usual boring stock drawings, you'll find rich, exciting illustrations that look like they are hand-painted or hand-drawn.

These images, located on two separate CD-ROMs and in the program's gallery, will help you create greeting cards that rival the store-bought variety. You can browse through them using an integrated Photo Album. The included copy of PictureWorks' image-editing program PhotoEnhancer Plus will let you add to and alter existing images and create your own graphics from scratch.

Rounding out this outstanding product's bulging feature set are a version of Netscape Navigator, an event reminder that will prompt you when special occasions approach, and the ability to import your personal address book.

All of these helpful features, combined with the product's ease of use and excellent array of stock images and photographs, make PrintMaster Gold Deluxe 3.0 the hands-down winner in this roundup.

## The Print Shop Publishing Suite

One of the original creativity programs in the category, The Print Shop continues to shine. This version, The Print Shop Publishing Suite, is a two-CD-ROM package that

## The Higher-End Option

Microsoft Publisher 97 doesn't quite fit into our product category, since it is a better HTML editor than personal desktop publishing tool. It does let you build some of the same projects that the other programs do, however, so it's worth a look.

Publisher is extremely easy to use, whether you're designing a birthday card or building your first Web site. Everything you'd ever want to do with the program has a corresponding wizard, so you're rarely left to your own devices. You can create 18 different types of projects including cards, postcards, resumes, flyers, labels, business cards, paper air-



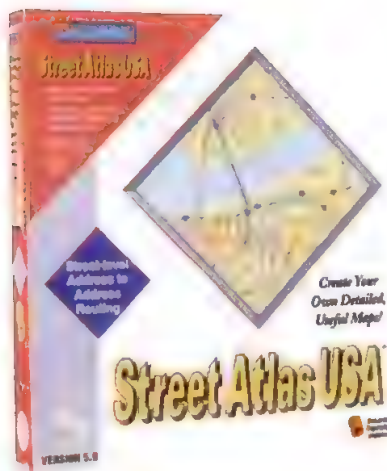
planes, and origami. There's a 5,000-image clip-art gallery, so you can add images and 160 borders to your projects. There's also a mail-merge feature that lets you address cards and letters without having to go through each one individually. On the downside, the editing tools are somewhat limited.

The program really shines when you use it to create your own Web site. If you have HTML experience, you may find Publisher's format limiting, but beginners will love its design and options.—KJB

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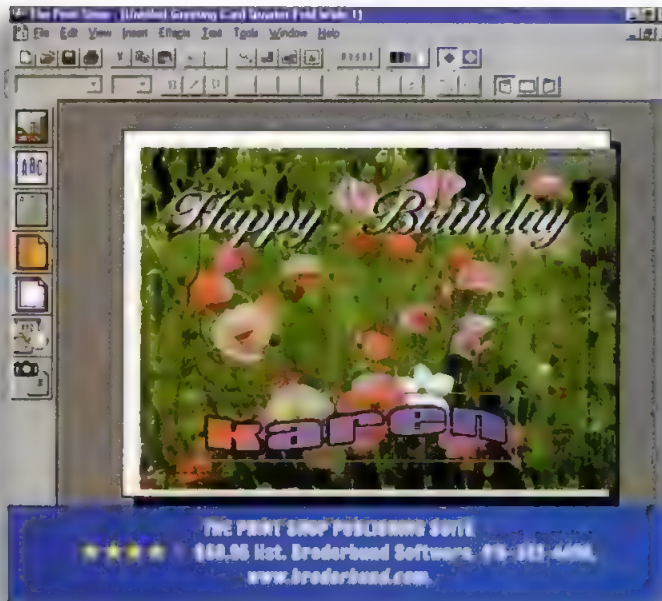


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# After Hours



is simple to use and includes advanced functionality, many preformatted projects, and a graphics designer.

The Publishing Suite incorporates The Print Shop

Premier Edition 5.0 and The Print Shop Press Writer. The Premier Edition is a totally icon-driven graphics and creativity program. Using this program, you make all of

your project choices by clicking on the corresponding icons on the menu. For most of the project types, you can then choose from one of three basic variations. To get started in your project, you can use one of the preformatted projects or templates, let the wizard walk you through a setup, or start from scratch. The program is so easy to use that even preschool kids can create their own projects.

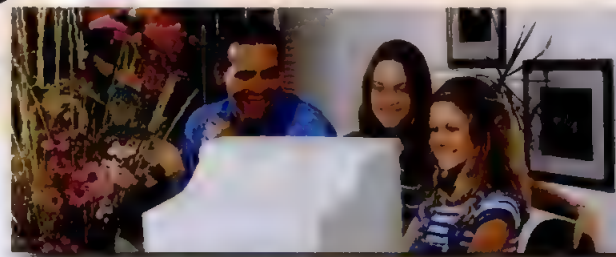
There are more than 26,000 images and photographs available to add to your designs. In fact, the sheer number of graphics and photos is rivaled only by PrintMaster Gold Deluxe. In addition to the standard types of cards and banners, you'll find unique projects within the program. You'll be able to design your own 3M Post-it Notes, résumés, and booklets. There's also a great

name and address book project that will help you address your holiday cards.

The Press Writer component of the suite is a higher-end desktop publishing program. Although you can use it to create newsletters and flyers, the program is better suited for reports, resumes, brochures, and booklets. You'll find features that include more than 1,000 quotes, 100 fonts, and customizable stylesheets. But this program's graphics support is not quite as robust as The Print Shop's.

Unfortunately, the Publishing Suite doesn't come with a Web browser. It does have an online option, however, that will let you send Online greetings to many of your friends and family. You can also connect with The Print Shop Web site, where you'll discover additional graphics and tips.

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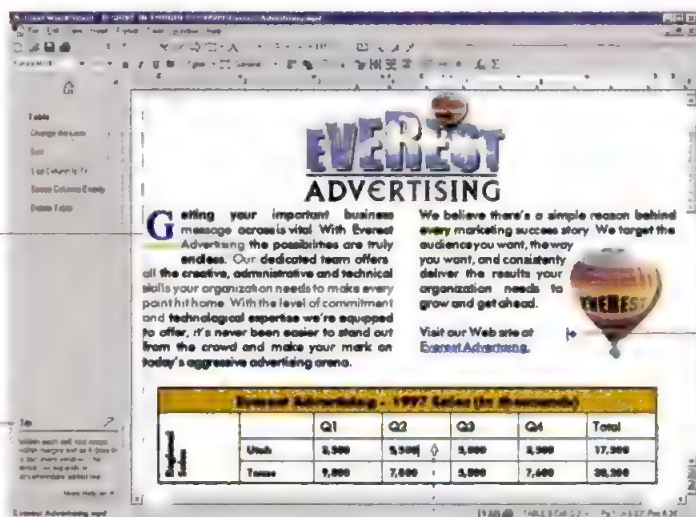
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*InfoWorld*

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## The Future of Racing

*Bethesda's new racing game lets you take the wheel of some cool concept cars.*

### XCar: Experimental Racing

If you feel the need to go fast—that is, really, really fast—Bethesda Softworks has the perfect racing game for you. XCar: Experimental Racing is great entertainment for racing fans who are bored with the virtual NASCAR and Indy Car circuits.

XCar is a DOS game that runs well under Windows 95. The game requires a Pentium/60 with 16MB RAM, but it runs much better with a Pentium/133 or higher. For the supreme XCar experience, you can run the game with a 3Dfx-based graphics card.

The game lets you enter the secretive world of prototype racing and brings to life the science of the sport. XCar: Experimental Racing offers ten tracks, a highly realistic physics model, and exceptional Super VGA graphics. In 3Dfx-enhanced mode, this game will blow you away, running at 60 frames per second. The audio is also impressive.

This game is more than just flash, however, and the real fun is to be had during the research phase of the game. Here you work to develop the fastest possible car. You have at your disposal an elaborate portfolio of the most advanced racing components, from which you can customize your car. Then you can test your vehicle on the high-speed oval, skid pad, or handling track.

Along with realistic collisions, pit stops, paint shops, and other hard-core simulation features that spoiled gamers like us have come to expect in a racing game, XCar includes

plenty of extras. You have a pit radio that warns you of passing cars and other track dangers, adjustable audio details, a tire and engine editor that lets you build these all-important parts from the ground up, and tons of telemetry data that lets you know exactly what needs to be adjusted on your high-speed prototype.

While it may not carry the

endorsement of any major auto-racing organization, XCar: Experimental Racing

offers everything a racing fan could possibly want.—Shane Mooney



## Baseball at Its Best

*Humongous tries its hand at a sports game for kids and delivers a winner.*

### Backyard Baseball

Over the years, we've come to rely on Humongous Entertainment for its consistently great kids' adventure games, starring such unforgettable characters as Putt-Putt, Freddi Fish, and Pajama Sam. With Backyard Baseball, the Seattle-based developer takes its first swing at a sports game for children. The result is an impressive, enjoyable, and rather challenging title.

Backyard Baseball is a hybrid title that runs on PCs running Windows (3.x or 95) and Macintoshes running System 7.0 or higher.

When you launch this game, you can play a pickup baseball game against the computer, take part in league play, or look over printable baseball cards of the game's 30 players. When you start a pickup game or a season of league play, you get to pick your team from this group. For parents, this is sure to bring back fond (or bitter) memories of the grade-school playground. Each player has his or her own strengths and weaknesses, as well as some unique spoken

commentary and animations.

Game play takes place on one of seven different fields, each one rendered in exquisite detail. When your team is in the field, you get a basic array of pitches to throw, but you can earn special bonus pitches (such as the Elevator Ball) based on your performance.

Similarly, you can earn special bats to use while at the plate. The best of these is the Under Grounder, which sends the ball into the ground to pop up at some unexpected spot. These special bats come in handy, since the computer makes for a particularly tough opponent.

During league play, the game will track an array of statistics so that you can see who's leading the league in a variety of categories.

Backyard Baseball is designed for ages 5 through 10, but the game is so much fun that we think many parents will find themselves vying with their kids for playing time.—Michael E. Ryan





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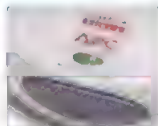
SurgeStation products now include: Eight outlets - three spaced to handle transformer blocks easily, a new building wiring-fault indicator, a right-angle plug to maximize your work space, and a switch large enough to be pressed on with your foot, but recessed enough to prevent accidental turn-off.

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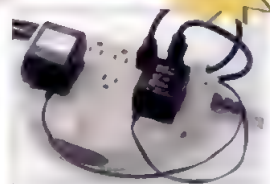
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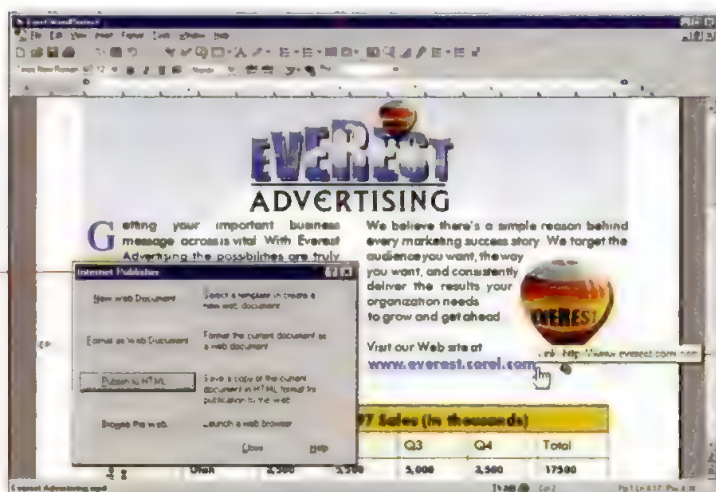
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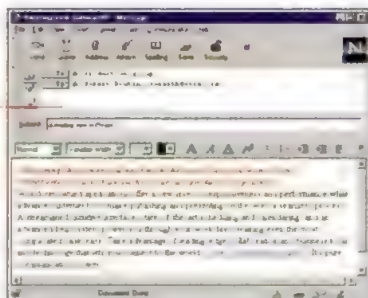
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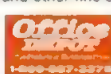
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I found the name "William Hunt Wilson" on the CD. The family tree was huge — hundreds of names! My name was not there, so I decided to contact the tree's contributor to let her know that I found the connection. I left a message, and that night, I received the long-awaited call. The contributor, who is also my cousin, was screaming on the phone because she could not believe she had found me. I was part of a "long lost leg" that the family had not heard of for over 50 years! We laughed, we cried, and talked all night. And now, we have contact every day — either by phone or by e-mail.

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Thank you!

*Diana Yashar*

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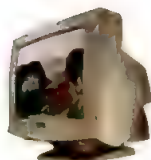
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PC Magazine, April 22, 1997



April 22, 1997  
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| Output                 | Good | Good      | Fair      | Fair | Fair | Poor | Fair      |

#### EASE OF USE

|                        |           |           |      |      |      |      |      |
|------------------------|-----------|-----------|------|------|------|------|------|
| Editing and retouching | Good      | Excellent | Good | Good | Fair | Fair | Good |
| Compositing            | Excellent | Excellent | Fair | Good | Good | Fair | Good |
| Painting               | Good      | Excellent | Fair | Good | Good | Poor | Fair |
| Output                 | Fair      | Good      | Good | Good | Good | Fair | Good |

PC Magazine, April 22, 1997

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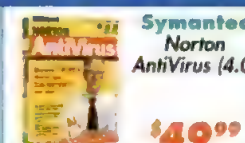
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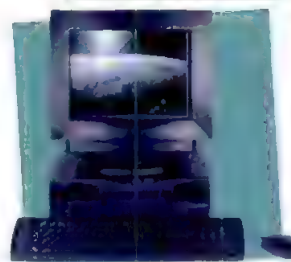
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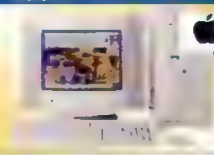
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## E-Commerce Web Sites

We also look at some of the best e-commerce sites already established and give you a take on what makes them tick.

## DVD Upgrade Kits

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## Web Database Development

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**PC Magazine**, ISSN 0894-8507, is published twice a month except in July and August, at \$49.97 for one year. Ziff Davis Inc., One Park Ave., New York, NY 10016-5802. Periodicals postage paid at New York, NY 10016-5802 and at additional mailing offices. POSTMASTER: Address changes to PC Magazine, P.O. Box 54093, Boulder, CO 80328-0093. The Canadian GST registration number is 14049 8720 RT. Canada Post International Publications Mail Product (Canadian Distribution) Sales Agreement No. 266477. Printed in the U.S.A.



# IBM 6x86 PR200 SYSTEMS <sup>from</sup> \$799<sup>99</sup>

## AMD-K6, Pentium II & 6x86...

In a recent review of AMD-K6 PCs, here's what PC Mag had to say...

"The Tiger K6 233 was this roundup's leading performer..."

"...its Business Winstone score led the pack."

"...its MMX numbers were unmatched."

—PC Magazine

Just \$799.99!...for a complete multimedia 200 system, featuring the acclaimed IBM 6x86 PR200—rated faster than a Pentium 200MHz! Now anyone can own a high-powered Windows 95 system and run all the power-hungry multimedia applications available today. Surf the Internet at top-speed with the 56K modem. Load tons of software and multiple full suites of applications on the huge 3 GB hard disk. Run sensational multimedia directly from the super-fast 24XV CD-ROM drive. We also have top-of-the-line systems featuring other great processors: The Intel Pentium II—the world's fastest, Intel's Pentium MMX, AMD's K6 MMX, and the IBM 6x86MMX—all of which are MMX-enabled for the future of MMX-enabled software. And all featuring state-of-the-art hardware and peripherals. Check the boxes below to find the right combination for you—and save! For MMX-enabled processors, the AMD-K6 is our favorite way to run Windows 95 or Windows NT—or even both at once! The AMD-K6 is our "best buy" processor for running Windows 95, Windows NT, OS/2 and other popular operating systems—high performance, 100% compatibility, low price, and MMX-enabled for amazing new MMX applications. Beats both the Pentium MMX and Pentium Pro! for Win 95 and NT. AMD's K6 is faster, uses less energy and runs cooler.

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 Finally, modems that will work in the basement! (Tiger Software catalog.)

## Forgive Me, Your Highness, But You Look Different Somehow

Here's how *The New York Times* explained some recent digital photography tricks: "Nucleus Imaging...took Karl Lagerfeld's photos of Princess Caroline and made a cover for *Harper's Bazaar* by grafting skin from one frame, hair from another...and the body from another. It was done with a Macintosh and a silicone graphics computer...."

Any IT director  has got to love this CD-ROM server. (TAC Systems ad.)

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"YOU KNOW, I'LL NEVER GET USED TO THAT 'EXPLODING BOMB' ERROR MESSAGE I GOT!"



 Are we just getting squeamish in our old age, or are computer games starting to get really yucky? (Ad for GT Interactive Software's Blood.)

## Cute Kiddie Comments

Christine Curti, assistant to *PC Magazine's* editor-in-chief, reports that her four-year-old daughter Catherine went down a playground slide head first and suddenly burst into tears. What was wrong? Was she hurt? Through her sobs Catherine said, "I just went through a Web site! Are there spiders on me?"



## Murder Most Foul

A shiver ran down our spines as we read this noirish item from the Bainbridge Island, Washington, police blotter: "April 29, 9:30 a.m. A South Beach Drive resident reported seeing a white object floating in the water near his residence. The object turned out to be a Packard Bell computer monitor, floating screen down. It was not identified as a stolen item."

If your entry is used, we'll send you \$50 and a *PC Magazine* T-shirt. Send your entries to Abort, Retry, Fail?, *PC Magazine*, One Park Ave., New York, NY 10016-5802. Winners this issue: Christine Curti, Jim Forkner, John Gorini, Bill Howard, and Michael Schuyler.



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